ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 7.] [1907.

XLI.—THE LINNEAN BICENTENARY.

The two-hundredth anniversary of the birth of Linnaeus was celebrated in Sweden with much enthusiasm between May 21st and May 25th last. The central ceremony took place at Upsala on May 23rd, Linnaeus having been born on May 23rd in 1707; the actual Linnéfest at Upsala was, however, preceded by celebrations at Lund on May 21st and followed by celebrations at Stockholm on May 25th.

The University of Upsala and the Royal Academy of Sciences of Stockholm invited, as their guests, delegates representing certain selected Universities, delegates representing those societies and institutions of which Linnaeus had been a member, delegates from all societies that bear the name "Linnean" as well as from all those that comprise a natural history section and that at the same time belong to the International Association of Academies, and finally, delegates from a few other Institutions. Among these was the Royal Botanic Gardens, Kew, represented by the Director.

The University of Lund thereafter kindly invited the delegates proceeding to Upsala for the celebrations of May 23rd to break journey at Lund and participate in the ceremonies organised for May 21st at Råshult, the birth place of Linnaeus. A considerable number of the delegates were able to avail themselves of this subsidiary invitation and were afforded an opportunity in the forenoon of inspecting a collection of Linnean relics and portraits and thereafter of examining the particular sections of University activity in which each was most interested. Under the kindly guidance of Professor Norstedt, himself a lineal descendant of Linnaeus' brother, we were able to pay a profitable visit to the Botanic Garden which, if small, is well laid out and well furnished, the Botanical Museum in which there are a number of interesting specimens, the Herbarium and the Laboratory, before joining the other guests at a luncheon, hospitably offered by Rector Ribbing, preparatory to leaving for Råshult.

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The house at Råshult which occupies the site of the one in which Linnaeus' father, who was then pastor of the parish, lived in 1707, is situated quite near the railway line from Lund to Stockholm. On the slope in front of the house stands a commemorative obelisk erected in 1866, surrounded by an open space which formed the meeting ground for those attending the celebration. At the foot of this slope a temporary platform was provided where the various trains drew up and disembarked their passengers. The local celebrations had been arranged for in the forenoon so that the afternoon was available for the academic ceremonies organised by the University of Lund.

The majority of the delegates who broke journey for the Råshult celebrations were taken back when these were over by special train to Elmhult, the nearest station in the direction of Lund. Here they dined as the guests of the University of Lund, and some time after midnight joined the night train from Malmö to Stockholm, which was reached next forenoon. Some, however, preferring to forego the Elmhult banquet and the four hours subsequent wait which this entailed, took an afternoon train and travelled direct to Stockholm, which was reached in the early morning on May 22nd. Those who adopted this course were able to breakfast comfortably before joining the forenoon train for Upsala, which was reached about noon.

Arrangements had been made beforehand by Mr. W. Carruthers, the delegate appointed to represent the Linnean Society, that a carriage should be in waiting when the train reached Upsala to take him to Hammarby, the country seat in which Linnaeus spent his summers when he was Professor at Upsala. Mr. Carruthers having kindly invited us to join his party we were thus enabled to spend a pleasant afternoon in a quiet and leisurely inspection of this place, so intimately associated with the great man whose memory we were there to celebrate.

Hammarby, which lies some miles south-west from Upsala, is preserved in much the state in which it was when Linnaeus resided there. In the house itself and in the small museum erected by Linnaeus on the little hill behind the house, are preserved relics of their illustrious owner which, if not very numerous, are at least exceedingly interesting. Perhaps more interesting, at least to our mind, than the house and the museum, were the garden, which is maintained as nearly as may be in the condition in which Linnaeus left it, and the grounds full of plants originally placed there by Linnaeus himself. The most striking of these at the time of our visit was *Corydalis nobilis*, great patches of which were in full bloom and made a memorable show.

The early morning of the 23rd brought by special train from Stockholm the greater number of the guests of the University to Upsala. Such of us as had arrived the previous day were requested to attend at the railway station when this train arrived and participate in the formal reception accorded by the University to its guests. Very cordial and striking this reception was and very manifest was the enthusiasm and interest evoked by the celebration not only in the students but in the people of the city. This reception over we were able to devote a considerable part of

the forenoon to visiting the formally arranged Botanic Garden, formerly the garden of the Royal Castle. The one sad feature of the celebrations to the botanical guests of the University was the fact that owing to the recent death of the lamented Professor Kjellman, this garden, for the moment, was without a Director and the Chair once filled by Linnaeus without an occupant.

The great central Fête, commemorative of the birth of Linnaeus, took place at 2 p.m. on May 23rd in the Aula of the University; this noble hall forms a magnificent semi-circular theatre facing a smaller apse, also semi-circular, which provides an ample stage, occupied for the time being by an orchestra and chorus. The various delegates, who had assembled beforehand and taken the places assigned them by the University authorities, marched into the hall in procession and filed off to their appointed seats. When this had been done a Royal party, headed by H.R.H. the Prince Regent of Sweden, entered; the audience rose and joined the orchestra and chorus in singing the Swedish National Anthem. The formal ceremonial at once began, with at intervals very beautiful music from the orchestra and the choir. After an address, delivered by Rector Schück, the delegates, introduced by a single representative for each country, presented their addresses; those for the United Kingdom were introduced by Sir Archibald Geikie, the delegate representing the Royal Society of London. The Swedish delegates, in two groups, were introduced after the foreign delegates. The whole ceremony occupied more than three hours; when it was over the foreign delegates were graciously received in the Chancellor's room by H.R.H. the Prince Regent; a few of the delegates were subsequently recalled individually in order to receive, at the hands of the Prince, the insignia of the order of the Polar Star, the decoration bestowed when he lived on Linnaeus himself.

The afternoon was devoted to various social gatherings, the most striking of which was a students' concert, given at the Botanical Garden, where the guests had an opportunity of understanding how magnificent the singing of the undergraduates of Upsala really can be. In the evening the guests, divided roughly into those whose pursuits are literary and those whose pursuits are scientific, were entertained at dinner by His Grace the Archbishop of Upsala, and by the Rector of the University and Madame Schück. The latter banquet, to which we were invited, was given in the handsome hall of the Norrland Nation, one of the largest of the twelve nations in which the students of Upsala are grouped. The toasts in addition to Royal toasts were few—the foreign guests, for whom Professor Haeckel replied; the Swedish guests, for whom Count Mörner, President of the Royal Swedish Academy of Sciences, responded; finally the Linnean Society of London, for whom Mr. Carruthers answered. The feast ended at 9 p.m. and the guests adjourned to attend a reception in the University Palace which ended what had been a well filled and interesting day.

The morning of May 24th was enlivened at 7 a.m. by the firing of 21 guns from the Castle Battery. To make quite certain that none of their guests should oversleep themselves after the arduous festivities of the previous day the authorities who had arranged

the ceremonies thoughtfully supplemented this salute by causing the great bell of the Cathedral to be rung at 8 a.m. and to go on ringing for a quarter of an hour. The great ceremony of the day was fixed for noon, guests being desired to assemble half an hour in advance, so that time was found to visit the old Botanic Garden attached to what in the eighteenth century was the town residence of Linnaeus, which is still kept as it was in his time. During this visit we were accompanied by Mr. C. de Candolle and by Professor and Mrs. Farlow. The season of our visit was too early to see the garden to advantage. After having seen Linnaeus' garden a visit was paid to the Botanical Museum and the Herbarium where it was desirable if possible to settle a crucial point connected with a species described by Thunberg. The University of Upsala had very kindly permitted the study at Kew, in connection with the preparation of the *Flora Capensis*, of the *Labiatae* belonging to Herb. Thunberg. When the other genera were sent the genus *Salvia*, being among the *Diandria*—for the Thunberg collection is kept apart and is still arranged according to the sexual system—was not forwarded; subsequently when the species of *Salvia* were transmitted for study it was found that the covers contained no example of *Salvia aurita*, Thunbg.

In spite of the heavy calls on their attention, Dr. Juel, Lecturer on Botany, and Dr. Sernander, Lecturer on Plant Geography, most kindly spared the time required, and the absence of *Salvia aurita* from the Cape covers was, when the type specimen was found, at once explained. The specimen, though the basis of a South African species, was not collected at the Cape but was raised in the Botanic Garden at Upsala from seed received from the Cape. The opportunity which has now occurred of examining the specimen disposes finally of what was a subject of considerable dubiety.

Assembling at 11.30 a.m. at the University Hall, the delegates had places assigned to them by the marshal of ceremonies and marched at noon in procession to the Cathedral of Upsala, which stands on the hillside below the University, there to witness the conferring of degrees in the four faculties of Theology, Law, Medicine and Philosophy. In addition to the Swedish graduates in all four faculties, in two of the faculties various strangers were selected for this honour. The system of selection adopted was officially explained as follows :—Les Facultés de Médecine et de Philosophie, pour lesquelles cette fête a naturellement une importance toute particulière, ont décidé de créer aussi, *honoris causa*, des docteurs étrangers, par une derogation à l'usage établi chez nous, laquelle paraîtra sans doute justifiée, en égard aux nombreuses relations étrangères de Linné. Ces facultes n'auraient pas désiré mieux que de pouvoir conférer, *honoris causa*, leurs différents grades à tous les illustres invités qu'elles auront, dans cette occasion, l'honneur d'accueillir au nom de la vieille Université de Linné. Toutefois, cela ne leur ayant pas, pour plusieurs raisons, paru possible, il a été décidé que seront reçus docteurs honoraires : un représentant pour les sociétés portant le nom de Linné, un autre représentant pour les savants étrangers, délégués des Universités et institutions dont Linné a été membre, et, enfin un représentant pour chaque pays ayant envoyé des délégués aux fêtes du bicentenaire.

The only three British Societies and Institutions of which Linnaeus was a member are :—

The Royal College of Physicians of Edinburgh ;
The Royal Society ;
The Society for the Encouragement of Arts, Commerce and Manufactures ;

the only British Society bearing his name is the Linnean Society of London.

Five honorary graduates were, in accordance with the system above described, selected from among the British delegates ; one, representing the Royal College of Physicians of Edinburgh receiving a degree in the Faculty of Medicine ; the other four, representing the three London Societies and representing the United Kingdom, receiving degrees in the Faculty of Philosophy.

As the procession filed into the Cathedral a solemn march was played, and when all were seated and the Prince Regent with the Royal Party had arrived, the first part of the University Cantata was sung. This cantata was written by Rydberg and set to music by Josephson for the historic graduation ceremony of 1877, when the University of Upsala celebrated its quatercentenary. The singing of special parts of the cantata preceded the promotions in the different faculties. The first faculty to be called was that of Theology ; the dean of the faculty and promoter of the thirty doctors being the Archbishop. At an appointed passage in his allocution he placed on his head the hat which in this University doctors may wear, and three cannon shots fired in quick succession from the Castle platform, greeted the faculty which he represented. One by one the *doctores electi* came forward and as each passed the promoter a doctor's hat was placed on his head, a single cannon shot being fired to mark his assumption of the degree ; in the case of Jubilee doctor two cannon shots were fired. Having passed the promoter each doctor received his diploma from another official, paid his respects to the Chancellor, made obeisance to the Prince Regent and returned to his seat. The procedure for the faculties of Law and Medicine, whose respective deans acted as promoters, was the same as for that of Theology ; in the case of the faculty of Philosophy it only differed in that the doctors received crowns of bay instead of hats and in addition to diplomas received gold finger-rings.

As the various doctors filed past the Chancellor and the Royal Party on their way to resume their seats the orchestra played a march which changed for each faculty. The doctors of theology were encouraged by the martial notes of the "War-march of the Priests," those of Law by the stirring strains of a triumphal march. The doctors of medicine went thoughtfully past to the accompaniment of a *marche funébre* ; those of Philosophy walked gaily to a "Wedding March."

The graduation ceremony occupied rather more than two hours ; at its close the delegates left the Cathedral in the order in which they had arrived, most of the new doctors returning to the University to assemble on the perron and there receive the congratulations of the students. This, which was for us the most striking ceremony of these two wonderful days, was seen perhaps

to greatest advantage from the balcony windows that overhang the main entrance of the University Palace. Far off and faint, one heard the sweet singing of the previous afternoon; then the banners of the University and of the nations came in sight and the sound grew in intensity as the students in a solid and orderly phalanx came slowly up the hill towards the steps of their noble hall. As the procession drew near it was seen that in its foremost ranks there were not a few of the young new doctors of philosophy—proud of their laurel crowns, loth to break with student associations. At the base of the perron the phalanx below us slowly melted into a wide girdle of white capped students, singing in unison round the new doctors. The song ended, the students uncovered, and their eager faces glowed as one stood forward and greeted the graduates on behalf of his fellows; one of the new doctors, Prince Eugene of Sweden, came forward and replied and the most beautiful and impressive of the ceremonies of the Linnéfest, where everything had been beautiful and impressive, was at an end.

The reason for the transference of the graduation ceremony from the University Hall to the Cathedral now dawned on one. A banquet to all the guests of the University had been arranged for in this hall at 6.30 p.m. Like everything else provided by the University of Upsala this was perfect; it broke up early to admit of the hall being cleared for a students' ball at 10.30 p.m., and thereby allowed those of the guests whose dancing days are done to take, if they chose, a late train for Stockholm which reached its destination at midnight.

Next morning it was therefore possible to visit the famous Hortus Bergianus at Albano near Stockholm and, guided by Professor Wittrock in person, to see the many interesting things that this garden contains and to make the acquaintance of the almost unique collection of portraits of botanists which it has been one of his pleasures to accumulate.

The great event of May 25th was the meeting, at 2 p.m., not in their own rooms but in the great hall of the Musical Academy, of the Royal Swedish Academy of Sciences. At this meeting the procedure adopted at Upsala as regards the reception of the delegates and of their addresses, was repeated, save that the Swedish delegates in this case were received before the foreign guests.

During the séance of the Academy two addresses were delivered by the President, Count Mörner, the formal proceedings being varied by the singing of a cantata commemorative of the life and work of Linnaeus. The culminating feature of the ceremony was the award by the President of the great Linnean medal struck especially for the occasion. The destination of this medal had not been allowed to transpire, and the announcement that the recipient of this unique and signal award was Sir Joseph Dalton Hooker, formerly Director of the Royal Botanic Gardens, Kew, caused the liveliest satisfaction to every one of the delegates present, Swedish and foreign alike. The enthusiasm with which the announcement of this happy decision was received was indeed only equalled by the regret which was expressed that our veteran chief had found himself unequal to the fatigue of being present in person to receive this crowning honour.

To the courtesy of Sir Joseph we owe an opportunity of examining the medal, which is a most beautiful example of the medallist's art, and we are further indebted to him for permission to publish here copies of the correspondence connected with one of the most interesting events in the history of Kew.

CORRESPONDENCE RELATING TO THE AWARD OF THE GOLD MEDAL COMMEMORATIVE OF THE BICENTENARY OF LINNAEUS.

FOREIGN OFFICE to Sir JOSEPH HOOKER.

Foreign Office,
June 10th, 1907.

SIR,

I AM directed by the Secretary of State to forward to you, herewith, the Gold Medal, commemorative of the Bicentenary of Linnaeus, struck for award to the most illustrious living exponent of botanical science, which the Swedish Academy has conferred upon you, and which, in your absence, was presented to Sir R. Rodd, His Majesty's Minister at Stockholm, by the Crown Prince of Sweden with the request that he would cause it to be forwarded to you.

Sir R. Rodd reports that at the Memorial Meeting held on May 27th, which was attended by delegates from many foreign countries, the President of the Academy, Count Mörner, passing from Swedish to English, referred to your great services to science in a speech of which copy is enclosed, at the conclusion of which the Crown Prince handed the Medal to Sir R. Rodd with cordial expressions of the gratification which the Award had given him.

Sir E. Grey wishes to associate himself with these sentiments and desires me to express his pleasure in giving effect to the wishes of the Crown Prince.

I am, etc.,
(Signed) ERIC BARRINGTON.

Sir Joseph Hooker, G.C.S.I., C.B.,
The Camp,
Sunningdale.

(Enclosure.)

YOUR ROYAL HIGHNESSES,

LADIES AND GENTLEMEN,

HAVING reminded you of the works of Linné I will add that in the eighteenth century he was King in the realm of Flora.

In the nineteenth he has been followed by worthy successors.

The Swedish Academy of Sciences has the honour of reckoning among its members one of these, Sir Joseph Dalton Hooker, who by his age stands near to Linné.

By his works he does so too.

By scientific expeditions to many parts of the world he has revealed the secrets of their vegetation. His extraordinary experience embraces both the nature of tropical India as also of sub-tropical and temperate climates as well as of the cold antarctic regions. The contents of his floristic works are therefore exceedingly rich. He has furthermore enriched botany by splendid works in other departments of this science, on the geographical distribution of plants, their classification and other matters.

On account of these merits the Academy wishes to show him especial honour on the day of Linné's Bicentenary by awarding him the Linnean Medal, which has been struck in commemoration of this day.

Unfortunately Sir Joseph Hooker is not present.

I must therefore beg the representative of His Britannic Majesty to receive the mark of honour that the Academy has awarded his illustrious countryman.

Sir JOSEPH HOOKER to FOREIGN OFFICE.

The Camp, Sunningdale,
June 12, 1907.

SIR,

I HAVE the honour of acknowledging the receipt of your letter of June 10, 1907, No. 18036, written under direction of the Secretary of State for Foreign Affairs, together with the Medal, struck in commemoration of Linnaeus, awarded to me by the Swedish Academy, and the copy of the speech delivered by Count Mörner, the President of the Academy, on the occasion of the Crown Prince of Sweden handing the Medal to the British Minister at the Court of Sweden for transmission to me.

I have now to request that you will convey to Sir E. Grey my grateful thanks for the aforesaid communications and most especially for the expression of his pleasure in giving effect to the wishes of the Crown Prince of Sweden; and I can most truly say that the gratification with which I have received this unique award is immeasurably enhanced by its being transmitted with the approval of my own Government, so cordially expressed by Sir E. Grey.

My thanks to Sir R. Rodd are enclosed in a separate envelope addressed to him at the Foreign Office for transmission.

I am, etc.,

(Signed) JOS. D. HOOKER.

Hon. Sir Eric Barrington, K.C.B.,
Foreign Office.

The Camp, Sunningdale,
June 19, 1907.

SIR,

I HAVE the honour of informing you that I have received from His Britannic Majesty's Minister for Foreign Affairs, Sir Edward Grey, the magnificent Gold Medal struck in commemoration of the Bicentenary of Linnaeus by the Royal Academy of Sciences of Sweden, awarded to me by that Society through the hands of H.R.H. the Crown Prince of Sweden.

Also that Sir Edward Grey did me the honour of accompanying the Medal with a copy of the Proceedings of the Academy on the occasion of the award, and with a letter informing me of his desire to associate himself with the sentiments of His Royal Highness and of the President of the Academy.

It remains for me to attempt to express my sense of the unique value of this award and of all it conveys to the scientific world as voiced by the President. It is the crowning honour of my long life, as inestimable as unexpected, and both on this account and in consideration of the gracious interposition of His Royal Highness the Crown Prince, I feel profoundly grateful.

Requesting you to convey to the President and my fellow members of the Academy my deep sense of the appreciation of my services to science and my wishes for its continued welfare and renown,

I am, etc.,

(Signed) JOS. D. HOOKER.

The Count Mörner,
President,
Royal Swedish Academy of Sciences.

The Camp, Sunningdale,
June 20, 1907.

SIR,

I HAVE to request that the enclosed letter addressed to Count Mörner, respecting the award to me of the Gold Medal struck in commemoration of the Linnaean Bicentenary may be forwarded by favour of the Foreign Office.

* * * * *

I have, etc.,

(Signed) JOS. D. HOOKER.

Hon. Sir Eric Barrington, K.C.B.

XLII.—NEW OR LITTLE-KNOWN MARINE ALGAE FROM THE EAST.

(With Plate.)

A. D. Cotton.

Amongst the marine Algae named in the Herbarium specimens of rarity and interest are frequently noted of which a permanent record is desirable.

In the present communication, which concerns only plants occurring east of India, descriptions are given of two new species, together with notes on some of the rare or critical species lately observed. Some of these specimens have been newly added, others have been in the Herbarium for many years. In the case of those examined from the Herbarium of Mr. E. M. Holmes, duplicate specimens or portions of specimens, have been kindly presented by him to Kew.

Endarachne Binghamiae, *J. Ag.;* Anal. Alg., Cont. iii., p. 27, tab. i., fig. 5; Okam., Alg. Jap. Exsicc. No. 86; *Phyllitis Fascia,* Kütz. in Okam. Illustr. Mar. Alg. Jap., vol. i., tab. 10.

The genus *Endarachne,* with one species *E. Binghamiae,* was described by J. Agardh in 1896 from California. Since then it has been recorded from Japan (Okamura), and in the Kew Herbarium a specimen exists from Hong Kong (Hong Kong Botanic Garden, No. 194). Its remarkable resemblance in external appearance to *Phyllitis Fascia,* Kütz., doubtless accounts for its being, until recently, entirely overlooked. In vegetative structure however the two species are very distinct, *Endarachne* being partly filamentous, whilst *Phyllitis* is entirely cellular; a further difference is found in the epidermal cells of the former being smaller than those of the latter.

The discovery of the genus *Endarachne* makes it doubtful whether *Phyllitis* is as widely distributed in the Northern Hemisphere as has been hitherto supposed. Though previously thought to be common in Eastern Asia we may now question its occurrence there at all: no specimens have been found in the Kew or British Museum Herbaria.

Halisèris undulata, *Okam.;* Syn. List, p. 10; Alg. Jap. Exsicc., No. 41. *Dictyopteris undulata,* Holmes; Journ. Linn. Soc., vol. xxxi., p. 251, tab. 8, fig. 1.

The plants collected by Wright in Japan, named and sent out by Harvey as *H. polypodioides,* var. *crispata,* Harv., prove on examination to be *H. undulata,* Okam. Recognised as a distinct species by Holmes in 1895, *H. undulata* differs from *H. polypodioides,* Ag., in the stout strongly stupose rachis, and the densely frilled lamina, which is blackish olive and of firm texture. The plant is also shorter, and much more robust, though it is now known to attain a greater length than that mentioned by Holmes.

Scinaia complanata, *Cotton,* sp. nov.

S. furcellata, Biv., forma *complanata,* Collins ms. in Phyc. Bor. Amer., No. 836.

A *S. furcellata*, Biv., fronde complanata avenia distincta.

Species complanata, membranacea, mediocris magnitudinis. *Frons* stratis duabus, interiore filis angustis laxe intextis, exteriore cellulis rotundato-angulatis in membranam unistratosam acte concretis. *Venae* nullae. *Rami* breves, decomposito dichotomi divergentes, 5–10 mm. lati, apicibus subacutis non attenuatis. *Cystocarpia* minuta, plerumque secus margines disposita. *Tetrasporangia* ignota. *Color* roseus.

JAPAN. Enoura, *Saido*, 9. In Herb. E. M. Holmes.

The present plant though resembling certain forms of *S. furcellata*, Biv., is evidently distinct from it. The very thin flattened fronds, their bright colour, and diverging branching, mark external differences, whilst in structure the entire absence of veins is a distinctive feature. Judging from the two specimens which have been examined (that of Collins and that of Saido) the plant is also decidedly smaller.

The note by Collins on Phyc. Bor. Amer., No. 836, stating that "the frond is flattened throughout, even when quite fresh," is of value in confirming the claim of this plant to specific rank. Although in Herbaria forms of *S. furcellata* often appear flattened, in the living state the fronds are found to be invariably cylindrical.

Scinaia complanata is at present known from two localities, Indian River Inlet, Florida, and Enoura, Japan.

The identity of Okamura's Alg. Jap. Exsicc. No. 2, and similar Japanese specimens, with *S. furcellata* of Europe, is, in the opinion of the writer, very doubtful. Dried material of the plant is so difficult to deal with, that a description of the structure, from living or carefully preserved material, is highly desirable.

Gigartina prolifera, *Hariot;* Alg. de Yokoska, p. 220; De Toni Syll. Alg., vol. iv., p. 211.

COREA. Port Hamilton, *Wilfred*, No. 732. In Herb. Hooker.

The only record of this species appears to be that by Hariot in 1891. In general habit the plant resembles *G. mamillosa*, J. Ag., young specimens of which might be confounded with it. The surface of the frond however remains entirely free from papillae, and the cystocarps, which do not appear to have been observed by Hariot, are embedded in more or less regularly arranged marginal proliferations. In some specimens these proliferations give the frond an almost pectinate appearance.

Callophyllis crispata, *Okam.;* Contrib. Mar. Alg. Jap., ii. p. 21, tab. 3, fig. 1–2; De Toni Syll. Alg., vol. iv., p. 286.

JAPAN. Shimoda, *Saido*, No. 47. In Herb. E. M. Holmes.

Though only known in Britain by the original reference this species is readily recognised. It approaches *C. laciniata*, Kütz., of Europe, and if Saido's specimens may be considered typical, it has, in addition to the differences mentioned by Okamura, a decidedly thicker frond.

Rhodymenia palmata, *Grev.*, var. **flabellata**, *Rosenv.*; Groenlands Havalger, p. 810; De Toni Syll. Alg., vol. iv., p. 513.

JAPAN. Shimoda, *Saido*, No. 48. In Herb. E. M. Holmes.

Rhodymenia palmata, Grev., though not occurring abundantly in the East, has often been reported from Japan. The present Japanese specimen is very distinct in form from all the well known varieties, being almost semicircular in outline, formed of short dichotomising branches and possessing a typical *Rhodymenia* structure. It agrees so well with the description of the variety *flabellata*, Rosenv., as to justify its being identified with that plant, notwithstanding the fact that up to the present the latter is only known from Greenland.

Gracilaria eucheumoides, *Harv.*; Proc. Amer. Acad., vol. iv., p. 331.

ANDAMAN ISLANDS. Termoklee Island, *S. Kurz*.

First discovered by Harvey in the Friendly Islands and later recorded by him from Japan, the distribution of this plant does not seem to have been otherwise extended. From its remarkable likeness to *Eucheuma*, it was thought to be not improbable that specimens under that name might be found in the Herbarium; this did not however prove to be the case. Though only known in a sterile state the *Gracilaria* structure marks it off as very distinct from *Eucheuma*.

Harvey's specimens (Friendly Island Algae, No. 35) are apparently young, and consequently the exact character of the mature frond, and the arrangement of the tubercles are difficult to determine. It seems likely that the plant remains decumbent, and that the young growing apices alone have an upward tendency. The tubercles, which are more or less pointed, appear to be almost entirely confined to the margins.

The Andaman specimens have somewhat more robust and flattened fronds, the margins of which are frequently densely set with spine-like tubercles.

Polysiphonia japonica, *Harv.*; in Perry's Narrative, vol. ii., p. 331.

COREA. Fusan, *Brand*, Jan. 1905.

Both J. Agardh and De Toni omitted to include this species in their respective works; hence the plant is little known and has been almost lost sight of. At the same time it does not appear to have been redescribed under another name, which suggests that it is not of common occurrence. The plants received from Corea were in fine condition, exhibiting both kinds of fruit.

In Journ. Bot. 1904, Mrs. Gepp transcribed Harvey's diagnosis of *P. japonica*, and at the same time recorded the plant from Wei-hai-wei, having compared it with a portion of the type specimen. The Corean examples are less corticated than those from China, in which respect they agree more closely with the original material.

Euptilota Fergusonii, *Cotton*, sp. nov.

Species distinctissima, dispositione pinnularum ab omnibus differt.

Planta tenue filamentosa, decomposite pinnata, usque 15 cm. longa. *Rami* filamentosi, primo nudi, demum rhizoidibus corticati, alterne pinnati. *Pinnae* nudae, breves, vix 1 mm. longae. *Pinnulae* insigniter dispositae, duae infimae facie superiore, ceterae facie inferiore pinnarum ortae. *Cystocarpia* in pinnis brevibus fertilibus terminalia. *Tetrasporangia* in pinnulis duabus infimis sparsa, terminalia aut lateraliter adfixa, sessilia.

CEYLON. Pantura, *Ferguson*, No. 20.

An exceedingly beautiful and delicate species having the habit of a *Plumaria* or a *Dasya*. The arrangement of the pinnae and pinnulae is remarkable and very constant. The lowest articulations of the pinna remain at first unbranched, whilst from the remaining articulations pinnulae are given off but always from the lower side. After some time, the two lowest articulations also give rise to pinnulae, but on the upper side only; these last-formed pinnulae become branched and bear tetraspores. The tetraspores appear to be confined to this position and the number produced is consequently small. The poorness of the tetraspore production is in marked contrast to many allied species, but is in agreement with such a plant as *Plumaria pellucida*, Schmitz. The arrangement of the pinnae and pinnulae shown in fig. 1 is characteristic, though for the sake of clearness, a somewhat slender and elongated shoot was selected. As a rule the shoots are more densely set with pinnae, the branches of which overlap thickly; at the same time the frond does not lose its delicate and wavy character.*

Another point in the structure of this species which demands attention is the method of cortication. The cortex is not composed of a dense cellular tissue as is common in the *Ptilotae*, but of a system of filaments resembling those found in *Callithamnion*, which give it a loose spongy texture. The origin of the filaments has not been made out with certainty, but there is little doubt that they arise from an outgrowth of the basal cell of a lateral branch (pinna) as in *Callithamnion* and as do the cells of the true cortex in *Ptilota*.

The systematic position of the species remains to be considered. The delicate fronds with fine main filaments remaining uncorticated for some distance from the apex, and the method of thickening, are characters more in common with *Plumaria* (especially such species as *P. Harveyi*, Schmitz, and *P. pellucida*, Schmitz) than with *Euptilota*. Though approaching *Plumaria* in the points just mentioned there is one important feature in which it differs, viz., the oblique apical cell, and resultant alternate branching; on account of this character the writer has been led to place the plant in *Euptilota*. This genus though usually

* In one specimen (a cystocarpic plant) the constancy of this arrangement was not maintained. The pinnae instead of producing pinnulae in the manner above described were frequently found to show alternate branching much as is seen in the extreme apex of a main branch. Cortical filaments however were not present as in the main shoots, and the pinnae remained short. These modified pinnae are intermediate in form between the normal pinnae and the long shoots; they appear to be of the same order as those that produce cystocarps, and may possibly represent branches the procarps of which were not fertilized.

more robust is characterised by alternate pinnae. The cystocarps of *E. Fergusonii* are borne at the apices of special short branches (modified pinnae), and by this character the plant is separated from *Rhodocallis*, Kütz.

Grateloupia affinis, *Okam.*; Bot. Mag. Tok., vol. vii., 1893, p. 100, tab. 5, fig. 3–5. *Gigartina affinis*, Harv.; Proc. Amer. Acad., vol. iv., p. 332.

One of Wright's original specimens exists at Kew, given by Harvey to Hooker. An examination of this specimen was thought to be advisable with the object of verifying the supposition of Okamura, as to the genus in which the plant should be placed. The examination proves Okamura to be right, the structure of the frond being that of *Grateloupia* and not that of *Gigartina*.

Explanation of the Plate.

All the figures refer to *Euptilota Fergusonii*, Cotton.

Fig. 1. Apex of a main branch showing arrangement of pinnae and pinnulae. The pinnae (*p.*) are alternate and bear pinnulae (*pl.*) on both their upper and lower surfaces. Those pinnulae from the lower surface arise first (*pl.* 1), those from the upper surface appear later (*pl.* 2); the pinnulae from the upper surface arise only from the two lowermost cells of the pinnae. The corticating filaments (*c.f.*) are also shown. × 180.

Fig. 2. Portion of an older branch showing tetraspore-bearing pinnulae (*t.*) on the upper surface of the pinnae. (The pinnulae from the lower surface of the two upper pinnae are omitted from the drawing for the sake of clearness.) × 90.

Fig. 3. A pinnula bearing tetraspores. × 180.

Fig. 4. A short branch (modified pinna) bearing cystocarps; the latter are surrounded by a number of pinnulae. × 80.

Fig. 5. Transverse section of a young stem showing commencement of thickening due to corticating filaments. × 90.

Fig. 6. Transverse section of older stem, showing spongy cortex. × 80.

XLIII.—REDUCTIONS OF THE WALLICHIAN HERBARIUM.—III. CYPERACEAE.

C. B. Clarke.

Cyperaceae.

3308. *Cyperus:* A. *C. viridis*, Hb. Roxb.; B. Bengal Inferior; C. *C. compressus*, Hb. Madras; D. *C. compressus*, Hb. Wight; E. *C. compressus*, Hb. Heyne; F. Riva Irrawady = Cyperus compressus, Linn.

3309. *Cyperus:* A. and C. *C. brevifolius*, Hb. Madras; B. Hb. Heyne = Cyperus stoloniferus, Retz, and Fimbristylis spathacea, Roth, mixed.

3310. *Cyperus*: *C. semiteres*, Hb. Heyne = Pycreus capillaris, Nees, *var.* nilagiricus, C. B. Clarke (*Cyperus globosus*, Allioni, var. *livida*, Heyne; *C. atro-ferrugineus*, Steud.).

NEW MARINE ALGAE

Euptilota Fergusonii

A.D.C. del.

Archer & Graham, Ltd. Lith. Edin. 1907.

To face page 264.

3311. *Cyperus: C. mucronatus* et *C. niveus*, Hb. Heyne = JUNCELLUS LAEVIGATUS, C. B. Clarke.

3312. *Cyperus:* A. *C. punctatus*, Hb. Roxb. = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn., var. *punctata*). B. Bengal Inferior = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn.). C. Bengal Inferior = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn., var. *punctata*). D. Hb. Wight = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn.), and MARISCUS SQUARROSUS, C. B. Clarke (*Cyperus squarrosus*, Roxb.), mixed. E. *C. pumilus*, Hb. Ham. Monghir = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn., var. *punctata*). F. *C. pulchellus*, Hb. Ham. Nathpur = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn.). G. *C. divaricatus*, Hb. Ham. Nathpur = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn.), and PYCREUS CAPILLARIS, Nees, *var.* STRICTA, C. B. Clarke, mixed. H. Rangoon = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn., var. *punctata*). I. Ava; K. var. *pumila*, Wall., *C. pollicaris;* L. *C. nitens*, Hb. Heyne; M. Segain; one sheet "3312" unlettered = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn.).

3313. *Cyperus:* A. *C. hyalinus*, Hb. Heyne = MARISCUS SQUARROSUS, C. B. Clarke (*Cyperus squarrosus*, Rottb.). B. Hb. Wight = MARISCUS SQUARROSUS, C. B. Clarke (*Cyperus squarrosus*, Rottb.), and PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn.), mixed. "3313" unlettered = CYPERUS FLAVIDUS, Retz.

3314. *Cyperus:* A. *C. arenarius*, Hb. Heyne = CYPERUS ARENARIUS, Retz, and CYPERUS TENERIFFAE, Poir., mixed. B. *C. nitens*, Hb. Madras = CYPERUS TENERIFFAE, Poir. C. *C. compressus*, Hb. Ham. Nathpur = CYPERUS COMPRESSUS, Linn.

3315. *Cyperus:* A. *C. juncifolius*, Hb. Madras; B. *C. Jeminicus*, Hb. Heyne; C. *C. rotundus*, Hb. Wight = CYPERUS STOLONIFERUS, Retz.

3316. *Cyperus:* Hb. Wight (one plant) = CYPERUS SUBCAPITATUS, C. B. Clarke.

3317. *Cyperus:* A. *C. geminatus, stoloniferus* aut *bulbosus*, Hb. Heyne = CYPERUS ROTUNDUS, Linn., and CYPERUS BULBOSUS, Vahl, mixed. B. *C. geminatus*, Hb. Madras; C. Hb. Wight = CYPERUS BULBOSUS, Vahl.

3318. *Cyperus:* A. *C. lividus* et *C. fuscus*, Vahl, Hb. Heyne = PYCREUS CAPILLARIS, Nees (*Cyperus globosus*, Allioni), and PYCREUS CAPILLARIS, Nees, *var.* NILAGIRICUS, C. B. Clarke (*Cyperus globosus*, Allioni, var. *livida*), mixed. B. *C. capillaris*, Roxb., et *C. strictus*, Hb. Wight a Cannanore = PYCREUS CAPILLARIS, Nees (*Cyperus globosus*, Allioni). C. Kamaon = PYCREUS CAPILLARIS, Nees (*Cyperus globosus*, Allioni), and PYCREUS CAPILLARIS, Nees, *var.* STRICTA, C. B.

Clarke, mixed. D. Napalia = PYCREUS CAPILLARIS, Nees (*Cyperus globosus*, Allioni). E. Bengal Inferior = PYCREUS CAPILLARIS, Nees, *var.* STRICTA, C. B. Clarke.—Put with 3318 and marked "3318" but not by Wallich, is Wallich n. 209 Tavoy = PYCREUS STRAMINEUS, C. B. Clarke (*Cyperus stramineus*, Nees).

3319. *Cyperus:* A. *C. cruentus*, Hb. Roxb. = PYCREUS SANGUINOLENTUS, Nees. B. *C. grossarius*, Ham., Hb. Heyne = PYCREUS SANGUINOLENTUS, Nees, and PYCREUS CAPILLARIS, Nees, *var.* STRICTA, C. B. Clarke, mixed. C. *C. foveatus*, Hb. Ham. Nathpur; D. *C. cruentus*, Hb. Wight, Cannanore; E. Bengal Inferior; F. Sylhet; G. Kumaon; H. Napalia = PYCREUS SANGUINOLENTUS, Nees. [G. is the type of *Cyperus atratus*, Boeck.]

3320. *Cyperus:* A. *C. filiformis*, Hb. Heyne = PYCREUS STRAMINEUS, C. B. Clarke (*Cyperus stramineus*, Nees), and PYCREUS POLYSTACHYUS, Beauv., mixed. B. Sillet = PYCREUS STRAMINEUS, C. B. Clarke.

3321. *Cyperus:* Napalia = CYPERUS ZOLLINGERI, Steud.

3322. *Cyperus:* A. *C. rotundus*, Hb. Ham. Nathpur; B. Hb. Finlayson; C. Bengal Inferior; D. Nepal; E. Kamaon = CYPERUS ROTUNDUS, Linn.

3323. *Cyperus: C. pusillus*, Hb. Wight = CYPERUS CASTANEUS, Willd.

3324. *Cyperus:* A. Napalia; B. Ava = PYCREUS ANGULATUS, Nees.

3325. *Cyperus:* A. *C. musarius*, Hb. Ham. Patna = SCIRPUS MICHELIANUS, Linn. B. Bengal Inferior; C. Hb. Wight; a sheet "3325" unlettered = JUNCELLUS PYGMAEUS, C. B. Clarke (*Cyperus pygmaeus*, Rottb.).

3326. *Cyperus:* A. *C. dubius*, Roxb., Hb. Wight; B. *C. dubius*, Roxb., Hb. Heyne; C. Bengal Inferior = MARISCUS DREGEANUS, Kunth.

3327. *Cyperus:* A. *C. racemosus*, Hb. Heyne; B. Hb. Wight; C. Bengal Inferior = CYPERUS EXALTATUS, Retz. [All this n. 3327 is the young state; figured by Roxburgh as *Cyperus umbellatus*.]

3328. *Cyperus:* A. Rajmahl; B. Bengal Inferior; C. *C. canescens*, Hb. Ham. Monghir = CYPERUS EXALTATUS, Retz.

3329. *Cyperus:* A. *C. procerus*, Hb. Roxb. = CYPERUS TUBEROSUS, Rottb. B. *C. alopecuroides*, Hb. Wight = CYPERUS TUBEROSUS, Rottb., and CYPERUS EXALTATUS, Retz, mixed. C. Hb. Wight; D. *C. Carmotha*, Ham. a Patna; E. *C. rotundus*, Hb. Heyne = CYPERUS ROTUNDUS, Linn. F. Hb. Heyne = CYPERUS STENOSTACHYUS, Benth., *var.* INDICA, C. B. Clarke [this is

Cyperus longus var. *gracilis*, Boeck., but has long stolons quite unlike *longus*] ; in Herb. Kew, 3329 F = CYPERUS TEGETUM, Roxb., *var.* AMBIGUA, C. B. Clarke. G. *C. laxus*, Hb. Heyne ; H. *C. rotundus*, Hb. Madras ; I. Ripa Irrawadi = CYPERUS ROTUNDUS, Linn. K. Mauritius, Telfair = PYCREUS FERRUGINEUS, C. B. Clarke. L. *C. Tesira*, Ham. Soondreebun = CYPERUS TUBEROSUS, Rottb. M. *C. Pangorei*, Hb. Ham. ; N. *C. Panimotha*, Ham. Gongachora = CYPERUS MALACCENSIS, Linn. [L. and M. are a little mixed—on one sheet.]

3330. *Cyperus : C. Pangorei*, Hb. Heyne ; etiam *C. subulatus*, ibid.= CYPERUS TEGETUM, Roxb. (one of two specimens), and CYPERUS TEGETUM, Roxb., *var.* AMBIGUA, C. B. Clarke (the other specimen).

3331. *Cyperus : C. strictus*, Hb. Heyne = PYCREUS FERRUGINEUS, C. B. Clarke.

3332. *Cyperus :* A. *C. tegetum*, Hb. Roxb. = CYPERUS TEGETUM, Roxb. B. *C. plenus*, Hb. Heyne = PYCREUS POLYSTACHYUS, Beauv., and PYCREUS FERRUGINEUS, C. B. Clarke. C. *C. geminatus*, Hb. Heyne = CYPERUS ROTUNDUS, Linn.

3333. *Cyperus : C. bicarinatus*, Hb. Heyne = PYCREUS POLYSTACHYUS, Beauv.

3334. *Cyperus :* A. Hb. Heyne = CYPERUS PILOSUS, Vahl, and CYPERUS PILOSUS, Vahl, *var.* OBLIQUA, C. B. Clarke, mixed. B. Napalia ; C. Kamaon ; D. Bengal Inferior = CYPERUS PILOSUS, Vahl.

3335. *Cyperus :* Ava = PYCREUS SANGUINOLENTUS, Nees (forma *khasiana*).

3336. *Cyperus : C. flavidus*, Hb. Heyne = PYCREUS PUNCTICULATUS, Nees. B. *C. lonyus*, Hb. Heyne = PYCREUS PUNCTICULATUS, Nees, *var.* QUINQUAGINTIFLORA, C. B. Clarke. C. *C. strictus*, Hb. Wight = PYCREUS PUNCTICULATUS, Nees, and PYCREUS PUMILUS, Nees (*Cyperus hyalinus*, Vahl), mixed. D. *C. elatus*, Hb. Wight = PYCREUS PUNCTICULATUS, Nees. E. *C. Bacha*, Hb. Ham. Nathpur = CYPERUS PILOSUS, Vahl, and CYPERUS BABAKENSIS, Steud., mixed. F. *C. procerus*, Hb. Madras = PYCREUS PUNCTICULATUS, Nees.

3337. *Cyperus :* A. *C. canescens*, Hb. Heyne ; B. Hb. Wight ; C. *C. fluitans*, Hb. Ham. a Pirgunj = CYPERUS PLATYSTYLIS, R. Br.

3338. *Cyperus :* Mauritius, Telfair = CYPERUS AEQUALIS, Vahl.

3339. *Cyperus : C. tortuosus*, Hb. Roxb. = PYCREUS NITENS, Nees.

3340. *Cyperus:* A. *C. polystachyus*, Hb. Wight; B. *C. polystachyus* et *C. strigosus*, Hb. Madras; C. *C. polystachyus*, Hb. Heyne; D. Bengal Inferior = PYCREUS POLYSTACHYUS, Beauv.

3341. *Cyperus:* A. Penang = CYPERUS ELATUS, Linn. B. Hb. Wight = CYPERUS PLATYPHYLLUS, Roem. & Schult.

3342. *Cyperus:* A. *C. inundatus*, Hb. Roxb.; B. *C. inundatus*, Hb. Ham. = JUNCELLUS INUNDATUS, C. B. Clarke. C. Bengal Inferior = JUNCELLUS INUNDATUS, C. B. Clarke, CYPERUS MALACCENSIS, Lam., and CYPERUS PILORUS, Vahl, *var.* MARGINELLA (*C. marginellus* Nees), mixed.

3343. *Cyperus:* A. *C. maximus* et *C. elatus*, Hb. Heyne; B. *C. parviflorus*, Hb. Heyne; C. *C. extensus*, Hb. Heyne; D. *C. spicatus*, Hb. Heyne; E. *C. acerosus*, Hb. Roxb.; F. *C. fastigiatus*, Hb. Madras; G. Hb. Wight a Ceylon; H. *C. verticillatus*, Roxb., Hb. Wight, Gingee; I. *C. verticillatus*, Hb. Ham.; K. Bengal Inferior = CYPERUS EXALTATUS, Retz.

3344. *Cyperus:* A. *C. verticillatus*, Hb. Roxb., is missing. B. *C. speciosus*. Hb. Wight; C. *C. speciosus*, *C. congestus* et *C. alopecuroides*, Hb. Heyne = JUNCELLUS ALOPECUROIDES, C. B. Clarke.

3345. *Cyperus:* Sillet = CYPERUS RADIATUS, Vahl.

3346. *Cyperus;* A. *C. racemosus*, Hb. Heyne; B. *C. fastigiatus* et *C. mysorensis*, Hb. Heyne = CYPERUS ELEUSINOIDES, Kunth.

3347. *Cyperus:* A. *C. complanatus*, Hb. Wight; B. Monghir = CYPERUS ELEUSINOIDES, Kunth.

3348. *Cyperus:* Bengal Inferior = CYPERUS PILOSUS, Vahl.

3349. *Cyperus:* *C. denudatus*, Hb. Heyne = CYPERUS STENOSTACHYUS, Benth., *var.* INDICA, C. B. Clarke.

3350. *Cyprus:* Attran = CYPERUS DISTANS, Linn. f.

3351. *Cyperus:* A. *C. gangeticus*, Hb. Roxb. = CYPERUS MALACCENSIS, Lam., and *C. tegetiformis*, Hb. Roxb. = CYPERUS TEGETIFORMIS, Roxb. B. *C. corymbosus*, Hb. Madras = CYPERUS TEGETIFORMIS, Roxb. C. *C. Koenigii*, Spreng., et *C. corymbosus*, Hb. Wight; D. Bengal Inferior; E. Kamaon; F. Sylhet; G. Ripa Irrawadi; H. *C. racemosus*, Ham. Gongachora, et *C. Nagarmotha*, Ham. Monghir = CYPERUS CORYMBOSUS, Rottb. [3351 E. is the type of *Cyperus enodis*, Boeck.]

3352. *Cyperus:* A. *C. corymbosus*, Hb. Heyne: B. *C. tenuiflorus*, Hb. Madras = CYPERUS TEGETUM, Roxb. C. Napalia = CYPERUS MALACCENSIS, Lam., and CYPERUS TEGETUM, Roxb., mixed. D. Kamaon = CYPERUS TEGETUM, Roxb.

3353. *Cyperus:* A. *C. Mothi*, Hb. Ham. Patna; B. Hb. Wight = CYPERUS ROTUNDUS, Linn.

3354. *Cyperus:* A. *C. pumilus* et *C. Jeminicus*, Hb. Heyne = CYPERUS ESCULENTUS, Linn. (forma = *C. Tenorii*, Presl.). B. Bengal Inferior = PYCREUS SANGUINOLENTUS, Nees.

3355. *Cyperus:* A. *C. carnosus* et *C. spadiceus*, Hb. Heyne = CYPERUS PROCERUS, Rottb. B. *C. tegetum*, Roxb., Hb. Wight = PYCREUS PUNCTICULATUS, Nees. C. Bengal Inferior = JUNCELLUS INUNDATUS, C. B. Clarke. D. Kamaon; E. Sillet; F. *C. Barungia*, Hb. Ham. Nathpur; G. Hb. Finlayson; H. Napalia = CYPERUS PILOSUS, Vahl. I. Irrawadi Ripa = CYPERUS PILOSUS, Vahl, with a root of C. ROTUNDUS, Linn., mixed. [E. is the type of *Cyperus honestus*, Kunth.]

3356. *Cyperus:* *C. albidus*, Hb. Heyne = CYPERUS ROTUNDUS, Linn.

3357. *Cyperus*: Bengal Inferior = CYPERUS PULCHERRIMUS, Willd.

3358. *Cyperus:* A. Hb. Finlayson; B. Bengal Inferior = CYPERUS DIFFUSUS, Vahl.

3359. *Cyperus:* A. *C. pallidus*, Hb. Heyne; B. *C. racemosus*, Hb. Wight; C. Hb. Finlayson = MARISCUS ALBESCENS, Gaud. D. Penang = CYPERUS PLATYSTYLIS, R. Br., and MARISCUS ALBESCENS, Gaud., mixed. E. Moalmayne = MARISCUS ALBESCENS, Gaud. F. *C. Gonus*, Ham. Nathpur = JUNCELLUS INUNDATUS, C. B. Clarke.

3360. *Cyperus:* A. *C. Iria*, Hb. Roxb.; B. *C. Iria*, Hb. Madras; C. *C. Iria*, Hb. Wight; D. *C. Iria*, Hb. Heyne; E. Sillet; F. Bengal Inferior; G. Napalia; H. Irrawadi Ripa; I. Hb. Ham.—*C. luteus* e Monghir, *C. Canconia* e Patna, *C. Santorii* e Nathpur, *C. Trinasori* e Monghir, *C. Marmotha* e Patna; K. Hb. Ham.—*C. Jalmotha* e Patna, *C. agrestis* e Govindgunj = CYPERUS IRIA, Linn.

3361. *Cyperus:* *C. Iria*, pygmaeus, Hb. Wight e Mysore = CYPERUS IRIA, Linn.

3362. *Cyperus:* A. Rangoon; B. Hb. Heyne = CYPERUS DIFFUSUS, Vahl.

3363. *Cyperus:* A. *C. difformis*, Hb. Roxb.; B. *C. difformis*, Hb. Madras; C. *C. difformis*, Hb. Heyne; D. *C. difformis*, Hb. Wight; E. *C. Haspan*, Hb. Ham. Monghir et Nathpur = CYPERUS DIFFORMIS, Linn. F. Sillet, F. D. = CYPERUS SILLETENSIS, Nees. G. Kamaon; H. Napalia; I. Bengal Inferior; K. Ripa Irrawadi = CYPERUS DIFFORMIS, Linn.

3364. *Cyperus*: A. *C. nitidus*, Roxb., Hb. Wight; B. *C. articulatus*, Hb. Heyne = CYPERUS ARTICULATUS, Linn.

3365. *Cyperus:* A. *C. strictus*, Hb. Heyne; B. Napalia; C. Sillet = CYPERUS FLAVIDUS, Retz.

3366. *Cyperus:* A. *C. distans*, Hb. Roxb.; B. *C. distans*, Hb. Heyne; C. *C. distans*, Hb. Wight; D. *C. distans*, Hb. Madras; E. Monghyr; F. Penang; G. Rangoon = CYPERUS DISTANS, Linn. f.

3367. *Cyperus:* Napalia = CYPERUS ZOLLINGERI, Steud.

3368. *Cyperus:* Sillet = CYPERUS HASPAN, Linn.

3369. *Cyperus:* A. *C. Haspan* et *C. hexangularis*, Hb. Wight; B. *C. Haspan*, Hb. Madras; C. Bengal Inferior = CYPERUS FLAVIDUS, Retz. D. *C. gracilis*, Hb. Heyne; E. Tavoy; F. Attran fl. Ripa = CYPERUS HASPAN, Linn. G. *C. graminifolius*, Hb. Ham. Nathpur = CYPERUS HASPAN, Linn., and *C. Trinchatra*, Hb. Ham. Monghir = CYPERUS FLAVIDUS, Retz.

3370. *Cyperus:* A. Penang = CYPERUS DIFFUSUS, Vahl. B. Amherst = CYPERUS PUBISQUAMA, Steud.

3371. *Cyperus:* A. Hb. Wight = RYNCHOSPORA AUREA, Vahl. B. Singapore = CYPERUS RADIANS, Nees & Meyen, and THORASTACHYUM BANCANUM, Kurz, mixed.

3372. *Cyperus:* Sillet = CYPERUS HASPAN, Linn.

3373. *Cyperus:* Monghyr = CYPERUS ROTUNDUS, Linn., and CYPERUS ROTUNDUS, Linn., *var.* CENTIFLORA, C. B. Clarke (the right hand example), mixed.

3374. *Cyperus:* *C. arenarius*, Spreng., Hb. Wight = CYPERUS ARISTATUS, Rottb., *forma* versicolor (*C. versicolor*, Nees).

3375. *Cyperus:* A. *C. aristatus*, Hb. Heyne; B. Hb. Wight = CYPERUS ARISTATUS, Rottb.

3376. *Cyperus:* A. Hb. Ham.—*C. angustifolius*, e Monghir et *C. cositicus*, e Nathpur = CYPERUS CUSPIDATUS, H. B. & K., *var.* ANGUSTIFOLIA (*C. angustifolius*, Nees): *C. Jalmothi* e Monghir = CYPERUS ARISTATUS, Rottb. B. Bengal Inferior = CYPERUS CUSPIDATUS, H. B. & K. One sheet "3376" unlettered = CYPERUS CUSPIDATUS, H. B. & K., and PYCREUS PUMILUS, Nees, mixed.

3377. *Cyperus:* A. *C. niveus*, Hb. Ham. Monghir; B. Napalia; C. Monghyr; D. Ripa Irrawadi; E. Sirmoor, Gerard; F. Kamaon = CYPERUS NIVEUS, Retz.

3378. *Remirea Wightiana*, Wall., Hb. Wight = REMIREA MARITIMA, Aubl.

3379. *Carex lachnosperma*, Wall., Napalia = CAREX HEBECARPA, C. A. Meyer.

var. β major, Napalia = CAREX LIGULATA, Nees.

3380. *Carex Wallichiana*, Prescott, is good.

3381. *Carex :* Napalia = CAREX LEHMANNI, Drejer.

3382. *Carex :* Napalia = CAREX MYOSURUS, Nees, *var.* EMINENS (*C. eminens*, Nees).

3383. *Carex :* Penang = CAREX CYRTOSTACHYS, Brogn.

3384. *Carex :* A. Nepal = CAREX MYOSURUS, Nees, *var.* EMINENS (*C. eminens*, Nees). B. Hb. Wight, Dindygul, alt. 2600 ft. = CAREX MYOSURUS, Nees.

3385. *Carex :* Napalia = CAREX SETIGERA, Don.

3386. *Carex :* Napalia = CAREX PRESCOTTIANA, Boott.

3387. *Carex :* Napalia = CAREX MURICATA, Linn., *var.* FOLIOSA (*C. foliosa*, D. Don).

3388. *Carex :* Napalia (one sheet, 4 or 5 plants) = CAREX LONGIPES, D. Don, and CAREX LONGIPES, D. Don, *var.* NEPALENSIS, Boott, mixed.

3389. *Carex :* A. Gossain Than = CAREX USTULATA, Wahl. B. Kamaon = CAREX CRUENTA, Nees.

3390. *Carex :* Hb. Ham. — *C. hortulana* et *C. fluviatilis* = CAREX WALLICHIANA, Prescott.

3391. *Carex :* Rajmahl = CAREX SPECIOSA, Kunth.

3392. *Carex :* Sillet, F. D. = CAREX CAESPITITIA, Nees.

3393. *Carex :* Nepal. Two plants mixed ; the main plant with terminal spike male at base, spikes short-peduncled, approximate, glumes deep brown, may possibly be CAREX OBSCURA, Nees ; the very slender plant with long slender distant peduncles and with all the spikes slender, male at top, glumes pale, may be CAREX STRACHEYI, Boott.

3394. *Carex :* Kamaon, R. B. ; type sheet = CAREX PHACOTA, Spreng. : second sheet = CAREX LIGULATA, Nees.

3395. *Carex :* A. Napalia = CAREX PHACOTA, Spreng., and CAREX JAPONICA, Thunb., *var.* ALOPECUROIDES (*C. alopecuroides*, D. Don), mixed, probably in pasting down. B. Sillet, F. D. = CAREX JAPONICA, Thunb., *var.* ALOPECUROIDES (*C. alopecuroides*, D. Don).

3396. *Carex :* Nepal = CAREX NUBIGENA, D. Don.

3397. *Carex :* Gossain Than = CAREX MYOSURUS, Nees, *var.* EMINENS (*C. eminens*, Nees).

3398. *Carex :* Nepaul = CAREX STRAMENTITIA, Boott.

3399. *Carex ? :* Taong Dong, Ava = CAREX FILICINA, Nees, *var. ?* MICROGYNA, C. B. Clarke.

3400. *Carex :* A. Napalia = CAREX CONDENSATA, Nees. B. Kamaon, R. B. = CAREX CRUCIATA, Wahl. [doubtful if the locality be correct]. C. Hb. Wight = CAREX

WIGHTIANA, Nees, and CAREX FILICINA, Nees, mixed. D. Hb. Heyne, marked *Scirpus paniculatus*, Koen., or *S. Eriophorum*, Vahl, is very doubtfully young CAREX FILICINA, Nees.

3400β. *Carex:* Gossain Than = CAREX VESICULOSA, Boott.

3401. *Hypolytrum:* Singapore = THORACOSTACHYUM BANCANUM, Kurz.

3402. *Hypolytrum:* A. Penang; B. *Hypolytrum zeylanicum*, Hb. Heyne = HYPOLYTRUM LATIFOLIUM, L. C. Rich.

3403. *Hypolytrum:* Penang = HYPOLYTRUM LATIFOLIUM, L. C. Rich.

3404. *Hypolytrum:* A. Martaban; B. Chappedong, Tenasserim; C. Sillet = HYPOLYTRUM LATIFOLIUM, L. C. Rich. D. Hb. Wight e Ceylona = HYPOLYTRUM LATIFOLIUM, L. C. Rich.: Hb. Finlayson = SCIRPUS CHINENSIS, Munro. E. Origo incerta: no sheet so marked, but an extra sheet marked "3404 Singapore" = THORACOSTACHYUM BANCANUM, Kurz.

3405. *Scleria:* A. Nepaul = SCLERIA TESSELLATA, Willd. B. Bengal Inferior = SCLERIA BIFLORA, Roxb.

3406. *Scleria:* Sillet = SCLERIA PERGRACILIS, Kunth.

3407. *Scleria:* Penang = two plants, SCLERIA SUMATRENSIS, Retz, and SCLERIA MULTIFOLIATA, Boeck., mixed.

3408. *Scleria:* A. Napalia = SCLERIA ELATA, Thwaites. B. Hb. Madras e Travancore = SCLERIA SUMATRENSIS, Retz. C. *Scleria trialata*, Hb. Ham., Gongachora = SCLERIA ELATA, Thwaites.

3409. *Scleria:* Singapore = SCLERIA BANCANA, Miq.

3410. *Scleria:* Penang = SCLERIA MULTIFOLIATA, Boeck., and SCLERIA LEVIS, Retz, mixed

3411. *Scleria:* Rangoon = two sheets; one sheet = SCLERIA LEVIS, Retz; the other = SCLERIA MULTIFOLIATA, Boeck.

3412. *Scleria: S. strigosa*, Hb. Heyne = SCLERIA CORYMBOSA, Roxb.

3413. *Scleria:* Hb. Wight = SCLERIA SUMATRENSIS, Retz.

3414. *Scleria villosula*, Wall.: Taongdong = SCLERIA HEBECARPA, Nees, *var.* PUBESCENS (*Scleria pubescens*, Steud.).

3415. *Scleria:* A. Moalmyne; B. Chappedong = SCLERIA HEBECARPA, Nees.

3416. *Scleria:* A. Penang; B. Hb. Wight; C. Hb. Heyne; D. *Olyra orientalis*, Hb. Madras e Courtallum = SCLERIA LITHOSPERMA, Sw.

3417. *Scleria :* Rajmahl = SCLERIA LITHOSPERMA, Sw.

3418. *Scleria :* Hb. Heyne = SCLERIA LITHOSPERMA, Sw.

3419. *Scleria : S. sessilis*, Hb. Heyne = SCLERIA LITHOSPERMA, Sw.

3420. *Scleria ? :* Mont. Sillet = CAREX sp., possibly C. cruciata, *Wahl.*, and SCLERIA sp., possibly S. sumatrensis, *Retz*, mixed.

3421. *Rynchospora :* Napalia = RYNCHOSPORA GLAUCA, Vahl.

3422. *Rynchospora :* A. Napalia ; B. Taongdong ; C. *Dichromena diandra*, Hb. Ham. Sukanuggur = RYNCHOSPORA WALLICHIANA, Kunth.

3423. *Rynchospora Prescottiana*, Wall. : Montes Prome, Ripa Irrawadi = RYNCHOSPORA LONGISETIS, R. Br.

3424. *Rynchospora :* A. Penang ; B. *Rynchospora aurea*, *Schoenus corymbosus*, et *Schoenus surinamensis*, Hb. Heyne = RYNCHOSPORA AUREA, Vahl.

3425. *Rynchospora : Schoenus articulatus*, Hb. Ham. e Nathpur = RYNCHOSPORA HOOKERI, Boeck.

3426. *Rynchospora : Cyperus melicoides*, Petit-Thouars, Mauritius, Telfair = RYNCHOSPORA AUREA, Vahl.

3427. *Rynchospora :* Singapore = CYPERUS RADIANS, Nees & Meyen.

3428. *Rynchospora : Scirpus retusus*, Koen., Hb. Wight e Ceylona = RYNCHOSPORA WALLICHIANA, Kunth.

3429. *Mariscus :* Penang = CYPERUS DIGITATUS, Roxb.

3430. *Mariscus :* Donabue, Ripa Irrawady = MARISCUS MICROCEPHALUS, Presl.

3431. *Mariscus* : Hb. Heyne = MARISCUS CYPERINUS, Vahl.

3432. *Mariscus :* A. Hb. Heyne ; B. Monghyr = MARISCUS TENUIFOLIUS, Schrad.

3433. *Mariscus :* Hb. Heyne = MARISCUS PANICEUS, Vahl.

3434. *Mariscus :* Hb. Madras = MARISCUS PANICEUS, Vahl, *var.* ROXBURGHIANA, C. B. Clarke.

3435. *Mariscus :* A. *Mariscus* et *Kyllinga*, Hb. Heyne = MARISCUS PANICEUS, Vahl, MARISCUS PICTUS, Nees, and MARISCUS CYPERINUS, Vahl, mixed. B. *M. sumatrensis*, Hb. Ham. Monghir = MARISCUS PANICEUS, Vahl, *var.* ROXBURGHIANA, C. B. Clarke. C. *Tunga*, Hb. Wight e Palaverum = MARISCUS BULBOSUS, C. B. Clarke, and MARISCUS PANICEUS, Vahl, mixed.

3436. *Mariscus :* Hb. Heyne = MARISCUS CYPERINUS, Vahl.

3437. *Mariscus :* A. Nipal = MARISCUS SIEBERIANUS, Nees. B. Bengal Inferior = MARISCUS PANICEUS, Nees, and

MARISCUS SIEBERIANUS, Nees, mixed. C. Prome; D. Hb. Finlayson = MARISCUS SIEBERIANUS, Nees. E. Hb. Russell = MARISCUS SIEBERIANUS, Nees, *var.* SUBCOMPOSITA, C. B. Clarke. F. Hb. Ham. Sunyashilkata = MARISCUS CYPERINUS, Vahl, *var.* BENGALENSIS, C. B. Clarke.

3438. *Mariscus:* A. *Cyperus digitatus*, Hb. Roxb.; B. *C. involucellatus*, Hb. Ham.; C. Penang; D. Ripa Irrawady; E. Ripa fl. Attran, all = CYPERUS DIGITATUS, Roxb.

3439. *Mariscus:* A. Rangoon; B. Penang; C. Singapore; D. *Cyperus spinulosus*, Hb. Wight; E. *Scirpus Luzulae*, Hb. Madras; F. *Cyperus Acsa*, Hb. Ham. Nathpur; G. Hb. Finlayson, all = MARISCUS MICROCEPHALUS, Presl.

3440. *Kyllinga:* Hb. Wight = KYLLINGA MELANOSPERMA, Nees.

3441. *Kyllinga:* A. *Schoenus triceps*, Hb. Heyne = MARISCUS BULBOSUS, Koen., and CYPERUS CEPHALOTES, Vahl, mixed. B. *Kyllinga triceps*, Hb. Russell, one sheet—this is a remarkable CYPERUS which I cannot at present name. C. Bengal Inferior; D. Sylhet = CYPERUS CEPHALOTES, Vahl.

3442. *Kyllinga*: Nepal, one sheet = KYLLINGA CYLINDRICA, Nees, and KYLLINGA BREVIFOLIA, Rottb., mixed.

3443. *Kyllinga:* A. *K. monocephala*, Hb. Roxb.; B. Hb. Wight = KYLLINGA MONOCEPHALA, Rottb. C. Hb. Madras = KYLLINGA BREVIFOLIA, Rottb. D. Hb. Heyne, Nundydroog = KYLLINGA CYLINDRICA, Nees, and KYLLINGA BREVIFOLIA, Rottb., mixed. [A and D are mixed on one sheet; B and C are mixed on another.] E. Hb. Russell [I can find no plant marked E, it was perhaps one of the two plants mixed in F, which is one sheet containing two things.]. F. Hb. Ham. Monghyr and North Bengal = KYLLINGA BREVIFOLIA, Rottb., and KYLLINGA MONOCEPHALA, Rottb., mixed. G. Singapore = KYLLINGA MONOCEPHALA, Rottb. H. Bengal Inferior = KYLLINGA MONOCEPHALA, Rottb., and KYLLINGA BREVIFOLIA, Rottb., mixed. I. Ripa Attran = KYLLINGA TRICEPS, Rottb.

3444. *Lipocarpha:* A. *Tunga triceps*, Roxb.; B. Prome; C. *Hypaelyptrum sphacelatum* et *Scirpus filiformis*, Hb. Heyne, all = LIPOCARPHA SPHACELATA, Kunth.

3445. *Lipocarpha:* A. *Kyllinga triceps*, Hb. Wight; B. Hb. Madras; C. Hb. Ham. Monghir, all = KYLLINGA TRICEPS, Rottb. D. *Cyperus capitatus*, Hb. Ham. Monghir = CYPERUS LEUCOCEPHALUS, Retz. E. *Kyllinga brevifolia?* Hb. Heyne = KYLLINGA TRICEPS, Rottb. F. Nepal; G. Kamaon; H. Sylhet, all = LIPOCARPHA ARGENTEA, R. Br.

3446. *Eriophorum comosum*, Wall. : Nepal, is good.

3447. *Eriophorum* : Patria dubia—one sheet = ERIOPHORUM COMOSUM, Wall., but mixed with leaves of SPODIOPOGON ANGUSTIFOLIUS, Trin.

3448. *Eriophorum arundinaceum*, Wall. : A. Paghamew, Ripa Irrawadi ; B. Penang ? both = ERIOPHORUM COMOSUM, Wall.

3449. *Eleocharis* : Kamaon = ELEOCHARIS PALUSTRIS, R. Br.

3450. *Eleocharis* : *Scirpus palustris*, Hb. Ham. Nawabgung = ELEOCHARIS PALUSTRIS, R. Br.

3451. *Eleocharis* : Montes Silhet = ELEOCHARIS PALUSTRIS, R. Br.

3452. *Eleocharis* : Nepal = ELEOCHARIS TETRAQUETRA, Nees.

3453. *Eleocharis* : A. *Scirpus spiralis*, Hb. Wight ; B. *S. plantagineus*, Hb. Heyne ; C. *S. spiralis*, Hb. Madras ; D. Hb. Ham. Nathpur ; E. Nepal, all = ELEOCHARIS FISTULOSA, Schult.

3454. *Eleocharis* : A. *Scirpus plantagineus*, Hb. Wight = ELEOCHARIS PLANTAGINEA, R. Br. B. *S. spiralis*, Hb. Madras = ELEOCHARIS SPIRALIS, R. Br., and ELEOCHARIS VARIEGATA, Kunth, mixed. C. Hb. Ham. — *S. seminudus*, Sukanuggur, et *S. plantagineus*, Monghir ; D. Bengal Inferior = ELEOCHARIS PLANTAGINEA, R. Br.

3455. *Eleocharis* : Oude = ELEOCHARIS PALUSTRIS, R. Br.

3456. *Scirpus* : Moolmyne = SCIRPUS ARTICULATUS, Linn.

3457. *Scirpus* : A. *S. subarticulatus*, Hb. Roxb. ; B. Hb. Wight ; C. *S. articulatus*, Hb. Ham. ; D. *S. praelongatus*, Hb. Ham. Birnoghur ; E. Nepal ; F. Sylhet ; G. Segain, Ripa Irrawaddi ; H. Kamaon ?, all = SCIRPUS ARTICULATUS, Linn.

3458. *Scirpus* : *S. fistulosus*, Hb. Heyne = SCIRPUS ARTICULATUS, Linn.

3459. *Scirpus* : A. *S. articulatus*, Hb. Wight ; B. *S. articulatus*, Hb. Heyne = SCIRPUS ARTICULATUS, Linn.

3460. *Scirpus* : *S. glomeratus*, Hb. Heyne = CYPERUS ARENARIUS, Retz.

3461. *Scirpus* : A. *S. supinus*, Hb. Wight ; B. *S. supinus*, Hb. Heyne ; C. *S. triqueter*, Hb. Heyne ; D. Hb. Ham. — *S. ensiformis*, Gujpur, et *S. lateralis*, Nathpur ; E. Bengal Inferior, all = SCIRPUS SUPINUS, Linn.

3462. *Scirpus* : *S. ternatus*, Hb. Ham. Nathpur = SCIRPUS ERECTUS, Poir.

3463. *Scirpus* : A. *S. Balna*, Hb. Ham. Monghir ; Asseerghur = SCIRPUS MARITIMUS, Linn., *var.* AFFINIS (*S. affinis*, Roth.).

3464. *Scirpus: S. bangalorensis*, Hb. Heyne = SCIRPUS CORYMBOSUS, Heyne.

3465. *Scirpus: S. quinquefarius*, Hb. Ham. Nawabgung = SCIRPUS QUINQUEFARIUS, Ham.

3466. *Abildgaardia:* Lungee, Irrawaddi, 1826. [A blank sheet with only the ticket.]

3467. *Scirpus:* A. *S. mysurensis*, Hb. Heyne; B. *S. biceps*, Hb. Ham. Amorha; C. *S. pungens*, Hb. Ham. Sunyasikata; D. Nepal; E. Monghir; F. Sillet; G. *S. triangulatus*, Hb. Telfair, Mauritius, all = SCIRPUS MUCRONATUS, Linn.

3468. *Scirpus:* Sillet = SCIRPUS ERECTUS, Poir.

3469. *Scirpus:* A. *S. lateralis*, Hb. Heyne; B. Hb. Wight; C. Nepal; D. Sillet; E. Bengal Inferior, all = SCIRPUS ERECTUS, Poir.

3470. *Isolepis:* A. *Scirpus grossus*, Hb. Roxb.; B. Hb. Ham. — *S. grossus*, Gungachora, *S. Kysur*, Nathpur; C. *S. Kysur*, Hb. Wight, Wallajabad; D. Nepal, all = SCIRPUS GROSSUS, Linn. f.

3471. *Isolepis: Scirpus flavus*, Hb. Heyne = SCIRPUS CORYMBOSUS, Heyne.

3472. *Isolepis: Scirpus Gonda*, Hb. Ham. Patna = SCIRPUS CORYMBOSUS, Heyne.

3473. *Isolepis:* Penang; Tavoy, n. 165, both = CYPERUS TURGIDULUS, C. B. Clarke (*Scirpus trialatus*, Boeck.).

3474. *Isolepis?:* Rangoon, n. 45 = CYPERUS [one of the *elegantes*, very young].

3475. *Isolepis: Scirpus acifolius*, Hb. Ham. Julpighuri = FIMBRISTYLIS AESTIVALIS, Vahl.

3476. *Isolepis:* Montes Sillet = BULBOSTYLIS CAPILLARIS, Kunth, *var.* TRIFIDA (*B. trifida*, Kunth).

3477. *Isolepis:* A. *Scirpus squarrosus*, Hb. Heyne; B. *S. squarrosus*, Hb. Madras; C. *S. capillaris*, Hb. Ham. = SCIRPUS SQUARROSUS, Linn.

3478. *Isolepis:* A. *Scirpus globulosus*, Hb. Ham. Govindgung = FIMBRISTYLIS DIPSACEA, Benth. B. Hb. Wight = SCIRPUS SQUARROSUS, Linn. C. Yenanghem et Segaen = FIMBRISTYLIS SQUARROSA, Vahl, and FIMBRISTYLIS DIPSACEA, Benth., mixed.

3479. *Isolepis:* A. *Scirpus aristatus*, Hb. Ham. Julpigori = FIMBRISTYLIS SQUARROSA, Vahl, and FIMBRISTYLIS AESTIVALIS, Vahl, mixed. B. *Scirpus aristatus* β, Hb. Ham. Patna; C. Bengal Inferior; D. Nepal; E. Silhet, all = FIMBRISTYLIS SQUARROSA, Vahl.

3480. *Isolepis:* A. Bengal Inferior = JUNCUS BENGHALENSIS, Kunth. B. Hb. Wight = BULBOSTYLIS BARBATA, Kunth, *var.* PULCHELLA (*Isolepis pulchella*, Thw.).

3481. *Isolepis:* A. *Scirpus antarcticus*, Hb. Wight; B. *S. cyperoides*, Hb. Ham. Gungachora = BULBOSTYLIS BARBATA, Kunth. C. *Scirpus antarcticus*, Hb. Heyne = BULBOSTYLIS BARBATA, Kunth, *var.* PULCHELLA (*Isolepis pulchella*, Thw.). D. Napalia; E. Melloon et Ava et Taongdong = BULBOSTYLIS BARBATA, Kunth.

3482. *Isolepis:* Hb. Wight — one sheet = FIMBRISTYLIS ALBICANS, Nees.

3483. *Isolepis:* A. *Scirpus argenteus*, Hb. Heyne; B. Hb. Wight; C. *Scirpus argenteus?*, Hb. Madras, all = FIMBRISTYLIS ARGENTEA, Vahl.

3484. *Isolepis:* A. *Scirpus nanus*, Hb. Ham. Govindgunge; B. Sillet = SCIRPUS MICHELIANUS, Linn. D. Ripa Irrawaddy = SCIRPUS MICHELIANUS, Linn., and JUNCELLUS PYGMAEUS, C. B. Clarke, mixed. [There is no sheet "3484 C".]

3485. *Isolepis: Scirpus gracilis*, Hb. Heyne = ELEOCHARIS CHAETARIA, Roem. & Schult.

3486. *Isolepis?*: A. *Scirpus capitatus*, Hb. Wight; B. *S. polytrichoides*, Hb. Heyne; C. Bengal Inferior, all = ELEOCHARIS CAPITATA, R. Br.

3487. *Isolepis?:* A. Hb. Wight = ELEOCHARIS CAPITATA, R. Br. B. *Scirpus capitatus* et *S. polytrichoides*, Hb. Heyne = FIMBRISTYLIS ACUMINATA, Vahl, FIMBRISTYLIS SCHOENOIDES, Vahl, and FIMBRISTYLIS POLYTRICHOIDES, Vahl, mixed. C. Bengal Inferior = FIMBRISTYLIS POLYTRICHOIDES, Vahl.

3488. *Isolepis?:* A. Hb. Finlayson; B. Singapore = FIMBRISTYLIS PAUCIFLORA, R. Br.

3489. *Isolepis:* A. *Scirpus ovatus*, Hb. Ham. Govindgunge; B. *S. atropurpureus*, Hb. Heyne = ELEOCHARIS ATROPURPUREA, Kunth.

3490. *Isolepis?:* A. *Scirpus bispicatus*, Hb. Roxb.; B. *S. schoenoides*, Hb. Madras; C. *S. schoenoides*, Hb. Wight; D. Bengal Inferior; E. Nepal = FIMBRISTYLIS SCHOENOIDES, Vahl. F. Rangoon = FIMBRISTYLIS TETRAGONA, R. Br.

3491. *Abildgaardia:* A. *Scirpus schoenoides*, Hb. Roxb.; B. *Cyperus indicus*, Hb. Ham. Nathpur; C. *Cyperus monostachyus*, Hb. Madras; D. Hb. Wight; E. *Cyperus monostachyus*, Hb. Heyne; F. *Scirpus polytischoides*, Hb. Heyne; G. Monghyr; H. Bengal Inferior; I, Lunggee, Ripa Irrawaddi = FIMBRISTYLIS MONOSTACHYA, Hassk.

3492. *Isolepis?:* Hb. Wight — one sheet = FIMBRISTYLIS TRISTACHYA, Thwaites.

3493. *Isolepis?:* Hb. Wight — one sheet = ELEOCHARIS CAPITATA, R. Br.

3494. *Isolepis ? :* Kamaon, R. B. — one sheet = FIMBRISTYLIS ACUMINATA, Vahl.

3495. *Isolepis ? :* Ava — one sheet = JUNCELLUS PYGMAEUS, C. B. Clarke.

3496. *Isolepis : Scirpus fastigiatus*, Hb. Heyne — one sheet = SCIRPUS NODOSUS, Rottb.

3497. *Isolepis :* A. *Scirpus tristachyus*, Hb. Ham. Monghyr ; B. *S. dipsaceus*, Hb. Heyne ; C. Napalia, all = BULBOSTYLIS BARBATA, Kunth.

3498. *Fimbristylis :* Hb. Wight — one sheet = FIMBRISTYLIS JUNCIFORMIS, Kunth, *var.* LATIFOLIA (*F. latifolia*, Kunth.)

3499. *Fimbristylis :* A. *Scirpus salbundius*, Hb. Ham. Burrisaul ; B. Taongdong ; C. Napalia, all = FIMBRISTYLIS QUINQUEANGULARIS, Kunth. [In Herb. Berol., 3499 C is = FIMBRISTYLIS SALBUNDIA, Kunth.]

3500. *Fimbristylis :* A. *F. emarginata*, Hb. Heyne ; B. *Scirpus miliaceus*, Hb. Heyne ; C. *S. miliaceus*, Hb. Madras ; D. *S. tetragonus*, Hb. Ham. Gongachora ; E. Sillet ; F. Napalia ; G. Ava, all = FIMBRISTYLIS MILIACEA, Vahl.

3501. *Fimbristylis : Scirpus arvensis*, Hb. Roxb. — one sheet = FIMBRISTYLIS DIPHYLLA, Vahl.

3502. *Fimbristylis :* A. Attran = FIMBRISTYLIS COMPLANATA, Link. B. Tavoy, W. Gomez = FIMBRISTYLIS ASPERRINA, Boeck., with one small piece of FIMBRISTYLIS COMPLANATA, Link, mixed.

3503. *Fimbristylis :* A. Napalia ; B. Bengal, both = FIMBRISTYLIS STOLONIFERA, C. B. Clarke. C. Sillet = FIMBRISTYLIS STOLONIFERA, C. B. Clarke, and FIMBRISTYLIS DIPHYLLA, Vahl, mixed.

3504. *Fimbristylis :* A. *Scirpus maritimus*, Hb. Ham. Nawabgunge ; B. Hb. Wight ; C. Oude, all = SCIRPUS MARITIMUS, Linn.

3505. *Fimbristylis : Scirpus atelius*, Hb. Ham. Magahar = SCIRPUS MARITIMUS, Linn.

3506. *Fimbristylis :* A. *Scirpus dipsaceus*, Hb. Heyne = FIMBRISTYLIS FERRUGINEA, Vahl. B. *Scirpus juncifolius*, Hb. Heyne = FIMBRISTYLIS FERRUGINEA, Vahl, and SCIRPUS LITTORALIS, Schrad., mixed. C. Hb. Finlayson = FIMBRISTYLIS DIPHYLLA, Vahl, and FIMBRISTYLIS FERRUGINEA, Vahl, mixed. D. Hb. Wight = FIMBRISTYLIS FERRUGINEA, Vahl.

3507. *Fimbristylis :* A. *F. glauca*, Telfair, Mauritius ; B. *Scirpus sylvaticus*, Hb. Heyne = FIMBRISTYLIS DIPHYLLA, Vahl. C. Sillet, F. D. = FIMBRISTYLIS SCABERRIMA, Nees.

3508. *Fimbristylis:* *Scirpus quadrifarius*, Hb. Ham. Sukanugger = FIMBRISTYLIS DIPHYLLA, Vahl.

3509. *Fimbristylis:* A. *Scirpus uniformis*, Rottb., Hb. Heyne; B. *S. dichotomus*, Hb. Heyne; C. Hb. Wight; D. *Scirpus dichotomus*, Hb. Roxb., all = FIMBRISTYLIS DIPHYLLA, Vahl. E. *Scirpus dichotomus*, Hb. Madras = FIMBRISTYLIS DICHOTOMA, Vahl, and a very young state of another species of FIMBRISTYLIS, mixed. F. Bengal Inferior = FIMBRISTYLIS DIPHYLLA, Vahl.

3510. *Fimbristylis:* A. *Scirpus tuberosus*, Hb. Heyne, Courtallum; B. Hb. Wight = FIMBRISTYLIS COMPLANATA, Link.

3511. *Fimbristylis:* A. *Scirpus dichotomus*, Hb. Heyne; B. *S. Nildurba*, Hb. Ham. Monghir; C. Hb. Wight; D. Asseerghur; E. Napalia, all = FIMBRISTYLIS DICHOTOMA, Vahl.

3512. *Fimbristylis:* A. *Scirpus plantagineus*, Hb. Roxb. = FIMBRISTYLIS QUINQUEANGULARIS, Kunth. B. Hb. Wight = FIMBRISTYLIS DIPHYLLA, Vahl. C. *Scirpus quinquesulcus*, Hb. Ham.; D. Bengal Inferior = FIMBRISTYLIS QUINQUEANGULARIS, Kunth.

3513. *Fimbristylis:* Ava — one sheet = FIMBRISTYLIS DIPHYLLA, Vahl.

3514. *Fimbristylis:* A. Hb. Wight = FIMBRISTYLIS MONTICOLA, Steud. B. *Scirpus Sarada*, Hb. Ham. Monghir = FIMBRISTYLIS TENERA, Roem. & Schult., *var.* OXYLEPIS (*F. oxylepis*, Steud.). C. Napalia; D. Kamaon, R. B. = BULBOSTYLIS CAPILLARIS, Kunth, *var.* TRIFIDA (*B. trifida*, Kunth). E. Bengal Inferior = BULBOSTYLIS CAPILLARIS, Kunth, *var.* TRIFIDA (*B. trifida*, Kunth), and FIMBRISTYLIS TENERA, Roem. & Schult., *var.* OXYLEPIS (*F. oxylepis*, Steud.), mixed.

3515. *Fimbristylis:* A. Attran; B. Bengal Inferior = FIMBRISTYLIS DICHOTOMA, Vahl.

3516. *Fimbristylis:* A. Napalia = FIMBRISTYLIS AESTIVALIS, Vahl. B. Bengal Inferior = FIMBRISTYLIS DICHOTOMA, Vahl.

3517. *Fimbristylis:* A. *Scirpus brevifolius*, Hb. Ham. = FIMBRISTYLIS DICHOTOMA, Vahl. B. *Scirpus Saparmotha* et *S. Tivarsar*, Hb. Ham. Patna = FIMBRISTYLIS AESTIVALIS, Vahl. C. Ripa Irrawaddy = FIMBRISTYLIS SQUARROSA, Vahl, and FIMBRISTYLIS AESTIVALIS, Vahl, mixed. D. Attran; E. Tavoy = FIMBRISTYLIS AESTIVALIS, Vahl.

3518. *Fimbristylis:* Penang — one sheet = FIMBRISTYLIS GLOBULOSA, Kunth.

3519. *Fimbristylis:* Napalia — one sheet = FIMBRISTYLIS RIGIDULA, Nees, and FIMBRISTYLIS JUNCIFORMIS, Kunth, mixed.

3520. *Fimbristylis:* A. *Scirpus obtusifolius* et *S. brevifolius*, Hb. Heyne = FIMBRISTYLIS JUNCIFORMIS, Kunth, and FIMBRISTYLIS JUNCIFORMIS, Kunth, *var.* ABBREVIATA (*F. abbreviata*, Boeck.), mixed. B. *Scirpus obtusifolius*, Hb. Ham. Monghyr; C. *S. brevifolius*, Hb. Wight; D. Napalia; E. Irrawadi = FIMBRISTYLIS JUNCIFORMIS, Kunth.

3521. *Fimbristylis:* A. *Scirpus miliaceus*, Hb. Roxb. = FIMBRISTYLIS DIPHYLLA, Vahl. B. *Scirpus diphyllus*, Hb. Heyne = FIMBRISTYLIS PODOCARPA, Nees & Meyen.

3522. *Fimbristylis:* A. *Scirpus diphyllus*, Hb. Heyne; B. Hb. Wight = FIMBRISTYLIS FERRUGINEA, Vahl.

3523. *Fimbristylis:* Mont. Sillet, F. D. = FIMBRISTYLIS NIGROBRUNNEA, Thw., *forma* subtetrastachya (*F. subtetrastachya*, Boeck.).

3524. *Fimbristylis:* *Scirpus tetragonus*, Hb. Wight = FIMBRISTYLIS MILIACEA, Vahl.

3525. *Fimbristylis:* A. *Scirpus membranaceus*, *marginalis* et *inaequalis*, Hb. Heyne = FIMBRISTYLIS DIPHYLLA, Vahl, and FIMBRISTYLIS COMPLANATA, Link, mixed. B. *Scirpus striatus*, Hb. Wight; C. *S. complanatus*, Hb. Roxb.; D. *S. complanatus*, Hb. Ham. Soondreebun = FIMBRISTYLIS COMPLANATA, Link. E. Napalia = FIMBRISTYLIS COMPLANATA, Link, FIMBRISTYLIS ASPERRIMA, Boeck., and CYPERUS CORYMBOSUS, Rottb., mixed. F. Sillet = FIMBRISTYLIS COMPLANATA, Link. G. Ava, is missing.

3526. *Fimbristylis:* Sillet = FIMBRISTYLIS SALBUNDIA, Kunth. [This is the type of Kunth's species *F. salbundia* but is not = Scirpus salbundius, *Ham.* (n. 3499A).]

3527. *Fimbristylis:* Amherst — one sheet = FIMBRISTYLIS FERRUGINEA, Vahl. [In Herb. DC., n. 3527 is = FIMBRISTYLIS SALBUNDIA, Kunth.]

3528. *Fimbristylis:* Chappedong fl., in Tenasserim = CYPERUS HELFERI, Boeck.

3529. *Fimbristylis:* Rangoon = FIMBRISTYLIS GLOBULOSA, Kunth.

3530. *Fimbristylis:* Nepal = FIMBRISTYLIS FUSCA, Benth. (*Abildgaardia fusca*, Nees.).

3531. *Isolepis?:* Bengal = FIMBRISTYLIS TENERA, Roem. & Schult., *var.* OXYLEPIS (*F. oxylepis*, Steud.).

3532. *Isolepis?:* Penang = FIMBRISTYLIS POLYTRICHOIDES, Vahl.

3533. *Carex?:* Saluen ad Neergye = CAREX INDICA, Linn., *var.* MILNEI (*C. Milnei*, Boott).

3534. *Carex psilochloa*, Wall.: cacumen Mont. Taongdaong = CAREX sp. [over-ripe and every utricle gone. Looks the same as some Assam-Manipur specimens of *Carex brunnea*].

3535. *Cyperus: C. arenarius?*, Hb. Wight = CYPERUS ARENARIUS, Retz.

3536. *Cyperus: C. fasciculatus*, Hb. Ham. Sukanuggur = CYPERUS SILLETENSIS, Nees. *Cyperus*, Amherst [field-ticket n. 25] = CYPERUS LEUCOCEPHALUS, Retz.

3537. ——: Sillet, F. da S. = COURTOISIA CYPEROIDES, Nees.

3538. *Scleria macrocarpa*, Wall. (Ptychocarya, *R. Br.*): Singapore = SCIRPODENDRON COSTATUM, Kurz.

3539. ——: Sillet, F. D. = SCLERIA ORYZOIDES, Presl.

3540. ——: A. *Olyra malaccensis*, Koen., Hb. Heyne; B. Sillet, F. D. = SCLERIA CARICINA, Benth.

3541. ——: Singapore = MAPANIA WALLICHII, C. B. Clarke.

3542. *Fuirena:* A. Sillet; B. Hb. Finlayson; C. *Fuirena pentagona*, Hb. Wight = FUIRENA UMBELLATA, Rottb.

3543. *Fuirena: Scirpus arvensis*, Hb. Heyne = FUIRENA UMBELLATA, Rottb.

3544. *Fuirena:* A. *Fuirena ciliaris*, Hb. Wight = FUIRENA GLOMERATA, Lamk, and FUIRENA UNCINATA, Kunth, mixed. B. Sillet; C. Prome = FUIRENA GLOMERATA, Lamk. D. [not taken up].

3545. *Fuirena:* Hurdwar — one sheet = FUIRENA WALLICHIANA, Kunth.

4470. *Holostemma fragrans*, Wall.: Ripa Irrawadi ad Prome et Taongdong, 1826, is missing from the collection. [At Kew one sheet numbered "4470" = MAPANIA SILHETENSIS, C. B. Clarke.]

4471. *Scirpus:* Ava = SCIRPUS ERECTUS, Poir. (*S. debilis*, Pursh).

4474. *Cyperacea?:* Sylhet, F. D. — one sheet = MAPANIA SILHETENSIS, C. B. Clarke. [This bears the MS. note:— Confer Chrysitricem (R. Br. monit) et etiam genus istud americanum.]

——. *Isolepis?:* Tavoy, n. 509, is very young; may be Eleocharis afflata, *Steud.*

——. *Isolepis:* Silhet = ELEOCHARIS CHAETARIA, Roem. & Schult.

——. ——: —— = FIMBRISTYLIS JUNCIFORMIS, Kunth.

XLIV.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW: V.

MOLLUSCA.

ALFRED SICH.

During the last few years a renewed interest has been taken in the study of our native *Mollusca*, especially of those families which include the slugs. Though several species of slugs and snails only too commonly make their presence known, there are many others which will probably escape observation in any particular area, unless special search is made for them. Doubtless there are several species inhabiting the Royal Gardens at Kew which have not yet been recorded.

GASTEROPODA.

LIMACIDAE.

Limax flavus, *Linn.* In the vicinity of the dwelling-houses.

When adult this slug may be known by its large size, yellow colour and beautiful bluish tentacles. It commonly occurs around the walls of houses, hiding in damp corners and even finding its way into cellars. It is active at night, but the slimy tracks it leaves on the walls may frequently be observed in the day time.

Agriolimax laevis, *Müll.* Close to the water along the Strip.

This is a small red-brown slug. When in motion the mantle appears situated almost in the centre of the animal on account of its remarkably long neck. In most of the other slugs the mantle lies much nearer the head. This species inhabits very damp places and may be found on plants growing at the water's edge.

ZONITIDAE.

Vitrea crystallina, *Müll.* Common along the Strip.

This small snail with its exquisite pearly white shell in which the umbilicus is minute, occurs, usually two or three together, under stones, bits of wood, &c., in damp places.

Zonitoides nitidus, *Müll.* Not rare along the Strip.

A rather small, almost black snail with a glossy red-brown shell having a deep suture. This species and the above-mentioned slug, *A. laevis*, so frequently occur in the same spot that if one of them be observed, the discovery of the other may confidently be anticipated.

ARIONIDAE.

Arion circumscriptus, *Johnston* (= *fasciatus*, var. γ, Nilsson). Occurs along the Strip and also in P.

This distinct species of slug, about an inch long, has sometimes been confused with *A. hortensis*, Fér., but in its typical form may easily be distinguished by the under surface being clear white, while *A. hortensis* is yellowish orange beneath.

AURICULIDAE.

Carychium minimum, *Müll.* Along the Strip.

One of our smallest land snails. Under a lens, the eyes, which are very black, may be seen even through the transparent shell. Not scarce in damp places but easily overlooked on account of its minute size.

LAMELLIBRANCHIATA.

UNIONIDAE.

Unio pictorum, *Linn.* The Lake.

The somewhat pearly shells of this species were formerly used by Dutch painters to contain their colours, hence the name bestowed by Linné. Though not the Pearl Mussel, this occasionally contains small pearls of inferior quality.

XLV.—MGOA RUBBER IN BRITISH EAST AFRICA.

(*Mascarenhasia elastica*, K. Sch.)

OTTO STAPF.

Mr. E. Battiscombe, Acting Conservator of Forests at Nairobi, B.E.A., communicated recently specimens of flowers and fruits of a rubber tree found by him in the Shimba Hills, near Mombasa. On comparison they proved to belong to *Mascarenhasia elastica*, K. Sch., a species previously known only from the neighbourhood of Dar-es-Salam, German East Africa, where it is worked occasionally by the natives for a kind of ball rubber called Mgoa rubber in the Zanzibar trade.

Mascarenhasia elastica was discovered by Dr. Stuhlmann in 1898 near Dar-es-Salam, and described and figured by the late Dr. Schumann in the *Notizblatt* of the Berlin Botanic Garden and Museum, vol. I. (1899), pp. 268–270. This is what the author says of it as a rubber tree : "Between the villages of Vikindo and Mbaffu there grows in moist places a robust tree which contains rubber latex and yields a superior kind of caoutchouc. The trunk branches usually low down and attains a height of 10 m. The pale grey bark is covered with scars from the knives of the rubber collectors, who produce from it large balls of rubber known as Mgoa in the Zanzibar trade. It is not particularly pure, containing fragments of bark, etc." Samples of this rubber received at the Botanic Museum, Berlin, are described by Dr. Warburg (*Der Tropenflanzer*, III., p. 220) as consisting of pale brown drawn-out caoutchouc threads intermixed with small particles of caoutchouc. In 1899 Herr Hedde, Government gardener at Dar-es-Salam, was commissioned to explore the neighbourhood of Dar-es-Salam and to study the distribution and properties of the tree. Dr. Schumann published an abstract from Hedde's official report in the *Notizblatt* of the Botanic Garden and Museum at Berlin, vol. III., p. 43. According to it *Mascarenhasia elastica* is fairly common in the

district visited by Hedde along streams as well as over underground water. It makes fine smooth and straight trunks which are much sought for by the natives, who use them in building their shambas. On the other hand Hedde found the flow of latex too slow to make collecting profitable. He further adds that the rubber produced does not sell well, possibly, as he says, on account of the crude mode of preparation. Attempts to take *Mascarenhasia elastica* into cultivation have been so far successful, as the plants grew fast even in dry soil, and flowered and fruited in their fifth year; but the flow of latex at that age was far too scanty (*Der Tropenflanzer*, X., p. 44).

As other species of *Mascarenhasia*, natives of Madagascar, are said to produce fairly good rubber, known as "Black Madagascar (Madagascar noir)," it was desirable to have an exact analysis of Mgoa rubber. This was made at the Imperial Institute from a sample communicated by Mr. Battiscombe last February to that establishment. Thanks to the courtesy of the Director of the Imperial Institute, we are able to publish the results of the examination of the sample mentioned.

Report on the composition of the rubber from the Shimba Hills, by the Director of the Imperial Institute.

Mark and weight of sample.—"Rubber from Shimba Hills, East Africa Protectorate," 104 grams.

Description.—Single ball of rubber, about $2\frac{1}{4}$ inches in diameter, evidently formed by winding threads of rubber upon a central mass; it was light brown, and contained a considerable quantity of vegetable impurity. The rubber was fairly strong.

Results of examination.—

—	Sample as received.	Composition of dry rubber.
	per cent.	per cent.
Moisture	10·0	—
Caoutchouc	69·0	76·6
Resin	6·1	6·8
Proteids	3·5	3·9
Insoluble matter	11·4	12·7
Ash	2·29	2·54

Commercial value.—3*s.* 6*d.* per pound in London; the current price of fine hard Para from South America was 5*s.* 2*d.* per pound.

Remarks.—The sample has the usual appearance of Landolphia rubber; it is of very fair quality though the amount of insoluble matter is rather high. This defect could be remedied by careful collection so as to exclude, as far as possible, fragments of bark from the rubber.

Consignments of this rubber, if well prepared, would be readily saleable at satisfactory prices.

Since the above was written a specimen of *Mascarenhasia elastica* has been received from the Uganda and British East Africa Exploration Syndicate, accompanied by a short note by Mr. Henry Dalziel, who reports: "The enclosed specimens of leaves, fruits, and wood are from a new kind of rubber tree, lately discovered by the natives in Wanga District, British East Africa, and called by them 'Goa.' This tree is generally found on the banks or near the sides of running streams where its roots can get easy access to the water. The stems are from a few to 18 inches in diameter, and form a bole 20 feet high to where it branches out. In old trees the bole has generally a great number of hollows, with a rough scaly bark which can easily be rubbed off; the inner bark is a quarter of an inch thick, and easy to cut. When the tree is cut the latex oozes out very slowly."

A specimen of the wood of *Mascarenhasia elastica* from the Wanga District, collected by Mr. H. Dalziel, is exhibited in Case 78, Museum No. I.

XLVI.—GUAYULE RUBBER.

(*Parthenium argentatum*, A. Gray.)

J. M. Hillier.

Among the plants of economic value belonging to the natural order *Compositae* none are more interesting than those known to contain rubber or a substance analogous to rubber. During the last decade considerable attention has been directed to two such plants of this order, viz:—the Colorado Rubber Plant (*Hymenoxys* sp.), a note on which appeared in *Kew Bulletin*, 1906, No. 6, pp. 218, 219, and the Guayule of Mexico, the subject of the present note.

The first communication received at Kew on the subject of Guayule was from the Mexican Land and Colonization Co., Ltd., 4, Moorgate Street, E.C., dated 29th December, 1902, requesting information regarding the following extract from Circular No. 28 issued by the United States Department of Agriculture:—

"An illustrative instance of the dangers likely to beset investments in rubber comes to hand as this Circular is being sent to the printer. A well-known journal* notices a new substitute for rubber, describing it as a gum obtained by grinding up the bark and 'comparatively hard wood' of a 'small scrubby bush' and then macerating in gasoline or other hydrocarbon solvent. 'By this process the gum that comes out is chemically pure and suitable at once for manufacture, and it forms a new composition consisting of resin of the plant combined with a residual portion of the hydrocarbon solvent.' The shrub, which has no milky

* *Scientific American.*

juice, is said to grow in abundance on the 'rolling land of Central Mexico, is readily propagated, may be cut two or three times a year, may be treated when fresh, or dried for export, and yields by weight 40 per cent. of a gum 'superior to most india-rubber,' and having the additional advantages of abundance, cheapness and ease of manipulation.

"The Indian name is said to be 'yule,' already known in application to *Castilloa*, while the scientific designation 'Synathereoeas Mexicanus' seems to have been unfortunately chosen, since the genus *Synantherias*, which has the only similar name known to botanists, is a member of the Aroid family.

"Moreover it is by no means clear how the 'comminuted shrub' without other provision than straining through a canvas bag, for the separation of the 60 per cent. of waste matter, can be expected to issue in the 'chemically pure' condition, since the oils, fats, resins, and many other vegetable substances would be incorporated by the solvent. Neither could such a process be carried out on fresh material, the water of which would prevent the action of the solvent. Similar inaccuracies are frequent in claims and applications for patents for artificial rubber substitutes, the published accounts of which are sometimes intended to draw public attention without unduly enlightening trade competitors. Naturally the knowledge of any such new source of wealth, or of a process by which a hitherto worthless natural product may be exploited, generally results in the greatest secrecy on the part of the first possessors of the information."

This passage doubtless refers to the Guayule, the name "Synathereoeas Mexicanus" being probably intended for "Sinantéreas mexicanas," *i.e.*, Mexican Compositae.

In January, 1905, a correspondent forwarded for identification a small section of a stem to which in a subsequent letter he gave the name "guala guayala," stating that he had found that 5 per cent. of the bark consisted of rubber of fair quality, but that he could get nothing from the wood, and that after a further examination of the so-called rubber, he believed that it was useless for any commercial purpose. This stem was determined as being that of *Parthenium argentatum*, A. Gray, a full account of which appeared in *Der Tropenpflanzer*, for May, 1905, and again in the *Bulletin of the Imperial Institute* for 1906, p. 114. The first identification of Guayule with *Parthenium argentatum* appeared in *Bull. du Jard. Colon.*, No. 1, July–August, 1901, p. 105. In the course of the present year further information with regard to Guayule has become available and is summarized in the paragraphs that follow.

On January 3rd, 1907, the following memorandum on Guayule, prepared by Mr. W. G. Max Müller, His Majesty's Chargé d'Affaires in Mexico, dated December 3rd, 1906, was transmitted to Kew from the Colonial Office for observation on the question of introducing the plant into the Colonies:—

"In my Report on the Mexican Budget for the current fiscal year (Annual Series. No. 3693, p. 9) I referred to the imposition of an export duty on 'Guayule.'

"Guayule is a form of rubber extracted from the Guayule plant, which grows in enormous quantities in certain of the Northern States of Mexico, especially San Luis Potosi, Zacatecas, Durango and Coahuila.

"The name appears to be a local term and is found in none of the Spanish Dictionaries. It may be a compound formed from 'hule,' *i.e.*, rubber.

"The Guayule industry has now passed from the experimental to the practical stage and is destined to attain considerable importance in Northern Mexico, and under these circumstances I feel that the following information which I have collected regarding this new industry may be of interest.

"Little more than two years ago the Guayule shrub was not only regarded as worthless, but was looked on as a veritable scourge by the Mexican land-owners. In fact, lands thick with this bush were considered worse than useless and could have been had for a merely nominal sum, while now many sales of Guayule on the ground have been reported at over five times the price at which the land itself was valued two or three years ago. Holders of tracts of these lands, who had to expend money on them for taxes and other purposes, found them burdensome in the extreme. Now many of these people have reaped fortunes from those same waste lands. For some years 'Guayule' had been known to contain rubber, but it is only within quite a short time that a process has been invented for the extraction of the gum for commercial use. As long ago as 1897, a German named Henry Lemcke, employed under the Mexican Ministry of Fomento, acquired a knowledge of the value of the Guayule plant, known then only to the Indians and a few others who discovered an elastic substance in the plant when chewing it. Mr. Lemcke informed the Mexican Government of his discovery and also offered it to various Companies interested in the rubber industry, with a view to ascertaining whether it was possible to extract a good quality of rubber from the shrub. Chemists and inventors began experimenting with the plant, but it was not really till towards the end of the year 1904 that the buying of the shrub began, at about $15 Mexican per ton. Speculation immediately began, and such was the number of persons anxious to secure quantities of Guayule large enough to justify them in erecting factories for applying the recently discovered processes of the extraction of the gum, that buyers have found it very difficult to purchase the plant, and recently contracts for large lots have been reported as high as $100 Mexican per ton.

"It is not to be expected that the gum extracted from the 'Guayule' will ever take the place of rubber, but it can be used as a substitute in many forms of manufacture, especially in a vulcanized form, and can be mixed in large proportions with rubber. In itself, it is inferior to real rubber, it has very little elasticity and will not bound as true rubber does, and is easily broken. It contains a great deal of soft, sticky matter. Fresh Guayule looks very much like old rubber which has been exposed to the air for years until it has lost its elasticity and strength. It requires therefore a considerable admixture of ordinary rubber to

give it strength enough for common commercial purposes. It has the further disadvantage that it deteriorates more rapidly than real rubber.

"Various extraction processes have been and are still being registered at the Mexican Patent Office, but none of these processes have as yet attained to any degree of perfection, as the known results vary from 10 to 12 per cent., whereas the quantity of gum contained in the shrub is known to be approximately 18 per cent. The quality obtained can better be judged by the price realized for the product of the various processes, which varies from 25 to 50 cents gold per pound on the New York market. There is still considerable difficulty in removing certain foreign substances and producing a pure rubber free from resin. However, a better finished product is gradually being produced, and I am informed that a sample lot of such excellent quality has been extracted by a new process still in the experimental stage, and not yet patented, that it fetched $1 gold per pound.

"Numerous companies for the extraction of the gum from the Guayule plant have been formed and many of them are so flourishing that big Corporations are active in securing control of the product. Factories have sprung up all over the north of Mexico, and already represent an outlay of many millions of dollars in buildings and machinery alone. The Continental Rubber Co. of America has large holdings of Guayule lands in Mexico. It is estimated that it has $9,000,000 Mexican invested in Guayule lands and factories in the country, and the output from its three factories at Torreon, Ocampo, and Saltillo, is said to be in the neighbourhood of 500,000 pounds per month. In addition to this there are, I am informed, twelve other large firms engaged in the trade, not to mention smaller factories.

"There are various processes of extracting the gum already patented, the best known being the Pablo Bergner, the Garza, the Delafond, the Lawrence, and the Hunieke processes, but none of them seem to be satisfactory so far.

"As I before said, the shrub is known to contain as much as 18 per cent. of rubber, but none of the present processes seem to furnish better results than 10 or 12 per cent., *i.e.*, a ton of the plant produces about 240 pounds of rubber. The cost of extraction is said to be about 10 cents Mexican a pound, and the price of a ton of the plant has never yet exceeded $100 Mexican, and is generally less. Then there is the cost of freight to the factory, which is in some cases very heavy, and certain other incidental expenses to be deducted.

"The price of Guayule rubber in New York has been as high as 75 cents gold, and in the summer went as low as 25 cents gold, owing to the action of the Continental Rubber Co. of America, but it has now attained again to 47 cents gold, so that even at the lowest price there is a handsome profit to be reaped in Guayule.

"The actual cultivation of the Guayule plant is still a problem, but it will be some time before the existing supply of Guayule is exhausted from the prairies of Northern Mexico, where it grows in such abundance. I have, in fact, seen it stated, that the value of the Guayule lands in Mexico is not less than $300,000,000

Mexican, and that the Guayule lands of one man, Salvador Madero, in the State of Coahuila, are worth over $40,000,000 Mexican.

"These valuations may be, and probably are, exaggerated, due to the mad speculation that has been taking place in Guayule, and which sent up the price per ton from $15 to $100 Mexican. That these prices will continue appears improbable, but in the opinion of those best qualified to judge, the Guayule industry in Mexico will have a great future if the landowners are sensible and do not ask exorbitant prices, and above all if they discover the secret of the planting and cultivation of the shrub.

"At present no one knows exactly how long it will take to raise Guayule shrubs, though the Department of Fomento is actively pursuing experiments to discover the best method of cultivating them.

"The price of Guayule actually depends on the price of rubber, and if there were no other considerations to be taken into account but the world's demand for rubber, the future of the Guayule interests would be assured. The rubber market, however, is controlled by the great American Companies, the Consolidated Rubber Co., and the United States Rubber Co. The former Company, which was organized last January, is supposed to control the stock of various subsidiary Companies interested in Guayule.

"Experiments are being conducted with the Guayule plant with a view to utilizing as fuel the refuse left over after the rubber has been extracted. If these experiments are successful, there will be a considerable reduction in the cost of manufacture.

"The Northern part of Mexico is not the only country where Guayule grows. There are millions of acres in Texas covered with the shrub, which has lately also been discovered in the Philippines.

"Extreme caution is necessary in dealing with this subject as the supplanting of the usual rubber of commerce by the gum of various herbs, vines, &c., has often led to rather wild speculations, not borne out by later practical results."

In the Foreign Office Report referred to by Mr. Max Müller, it is stated under the heading of "Export Duties" that "the total increase of about £7,000 under this heading is almost entirely due to the duty which, in the present Budget Bill, is for the first time to be imposed on Guayule, a form of Cactus extract which is now used and exported in considerable quantities for mixing with rubber."

A memorandum on the Guayule prepared at the instance of H.M. Envoy Extraordinary and Minister Plenipotentiary, Mexico, by Mr. Vice-Consul Kennedy, on information furnished to him by Mr. Adolph Marx, the manager of a Mexican company for the export of this rubber, was forwarded to Kew from the Foreign Office, March 22nd, 1907, together with specimens of the plants of Guayule, determined as *Parthenium argentatum*, and of the Mariola, *P. incanum*, a species apt to be confused with Guayule.

From this memorandum it appears that "the first shipments of Guayule rubber to Europe (1902) were received with scant favour, and the shippers were extremely glad to at last get an offer from a London firm of 6*d.* per lb.

"A few months later a German manufacturer offered 1*s.* per lb. for the rubber, whilst an American offered 25 cents gold per lb. At the beginning of 1903 the same American offered to take the whole output of the factory at 40 cents per lb.

"Since that date, as manufacturers have become accustomed to this rubber, the price has steadily advanced until 1906, when the highest price was reached, viz., 2*s.* 9*d.* per lb.

"Guayule, or the *Parthenium argentatum*, is a shrub growing to about 3 feet high at maturity. It is of very slow growth, and the samples accompanying this memorandum are probably at least 30 years old.

"From the first year, when only about 6 inches high, and with a very thin stem, it gives both flowers and seed, and so on every year, and as it cannot be used for extracting rubber until the eighth year, this gives the plant ample time to reproduce, the seed being blown about by the wind.

"Up to the third year the plant contains no rubber whatever, and from the third to the eighth year the percentage of rubber is small.

"A good well-matured plant will contain as much as 10 per cent. of its weight in rubber.

"The best process for extraction is that originally employed by the Anglo-Mexicana Co., viz., maceration of the plant, and extraction of the rubber by steaming in an alkaline solution.

"Unless the shrub is recently taken from the ground, the quality and quantity of rubber obtained is inferior.

"From several factories in operation, and one in course of construction, the estimated total production from all sources will not be less than 300 tons per month.

"At present there is sufficient raw material in sight to supply all these factories for several years, say three or four, but there is no plantation of Guayule to make good the plants used up; it is only a question of time when this source of rubber will be almost entirely exhausted.

"The Guayule shrub is only found in the colder parts of the Republic, and is not met with south of the Tropic of Cancer. It is principally obtained from the States of Zacatecas and San Luis Potosi.

"Mariola is another shrub which can easily be mistaken for Guayule from the similarity of the colour of its leaves, &c., especially in the wet season. It grows in the same region as the Guayule. The Mariola also contains rubber, but in such small quantities that it is not worth while to extract it."

According to "The Mexican Investor" of March 23rd, 1907, it appears that during the year 1905 a factory in Germany, backed by large financial interests, for the extraction of rubber from Guayule, experienced its most profitable run. The shrub was bought, baled, and shipped by Mr. Oton Katterfeld, who traversed most of the territory where Guayule was known to grow, and who secured many thousand tons at prices that look ridiculously low at the present time. This German enterprise was kept very quiet, and must have made much money until in September the Mexican Government put an export duty of 15 pesos a ton on the shrub which, with the freight rates, made further shipments unprofitable.

The following article, from the pen of Dr. P. Olsson-Seffer, Director of the Zacualpa Botanical Station and Rubber Laboratory in the Republic of Mexico, which appeared in a recent number of "The Mexican Investor," sums up the present position and prospects of the Guayule industry.

"The supply of Guayule has been greatly over-estimated, principally because of the confusing of Guayule with another species of the same genus, *Parthenium incanum*, H. B. K., which is far more abundant and grows all through the Guayule territory. This has been estimated to as much as 28,000 square miles, but it must be remembered that the patches of Guayule are far apart and one can travel over miles in the Guayule country without seeing a single specimen. The general estimates of Guayule on the acre is from 400 to 700 pounds, taking an average for large areas. This is undoubtedly too high an average. By actual count in very favourable localities I have become convinced that even under the best conditions not more than 1,500 pounds can be obtained per acre from the Guayule patches, and these constitute less than one-tenth of the total area of the territory, where the plant occurs. That my estimate in this regard is upheld by others who have investigated the matter and expressed an unbiased opinion is shown by the following lines, translated from an article by Dr. R. Endlich, in *Der Tropenpflanzer*, 1905, pp. 233–247. The author says in part :—

"'The supply of the Guayule is very unevenly distributed in the territory the plant occupies. In most places the plants are isolated, growing sometimes in large and often in small numbers among the other plants. At rare intervals small patches are found where it is predominating in the chaparral flora.

"'It is very difficult to make an estimate of the average supply per hectare, both on account of the uneven distribution of the plant and because of the difference in size of individual specimens. In favourable territory I have on several occasions counted thirty to forty plants on an area of 100 square meters, which would mean a total supply of 3,000 to 4,000 Guayule plants per hectare (=1,215 per acre). The differences in size and weight are so great that in places where the plants are small and grow close together ten plants have a weight of only one kilogram (=$2\frac{1}{5}$ lbs.), while in the best territories some of the trees weigh as much as 3 kilograms each. The average weight will probably not exceed 500 grams ($1\frac{1}{10}$ lb.) per plant.

"'Estimates of the Guayule supply in large areas vary from 500 to 800 kilograms per hectare, but the distance between the different places where the plants are found is often considerable, and must be taken into consideration.'

"The Guayule shrub is about two feet high, with knotted, spreading branches and sparse, greyish leaves. The whole plant contains rubber, with the exception of shoots bearing leaves and flowers. Consequently the whole plant is gathered and the supply is rapidly exhausted on the area where gathering is done. Even the roots are in most cases pulled up by the collector, and the opportunity for re-growth is reduced to a minimum.

"The rate of growth is very slow, so that a plant 20 inches high is three to four years old, while plants five years old are not more than 30 inches high. Such a plant would weigh about four pounds. In view of these facts it seems more than illusionary to speak of growing the Guayule plant for commercial purposes. Brought under domestication the plant could naturally be made to grow much faster, but there are still other factors to be taken into consideration. The dry country in which the Guayule plant grows, has a very scanty and irregular rainfall. For an agricultural crop that kind of land can hardly be expected to supply the necessary requirements, and the uncertainty about the germination of the seed brings in such an element of chance, that indeed very much faith in Providence must be present to undertake the growing of Guayule without any provision for occasional artificial irrigation. The price paid has been as high as $43 per ton of dry plants, pressed into bales, and delivered at railroad station. With that price, and the slow growth of the plant, it is difficult to see how anyone can in earnest consider the cultivation of Guayule. Factories operating a large area should naturally take some steps for re-covering the ground with Guayule, but beyond sowing the seeds and taking the chance of their germinating and growing in a few years to a size that can be utilized, it is hardly possible to do anything.

"As for the fear of Guayule filling the market to the exclusion of crude rubber from previous sources of wild tropical rubber and from present and future plantations, such an idea is hardly worth refuting. If we remember that the requirements at present of the United States alone amount to more than . . . . . 60,000,000 lbs. annually, a simple mathematical calculation, based on the most exaggerated expectations of the output of Guayule rubber from the entire territory where it is growing, will show the role this product could have in the world's market, even supposing that the supply was inexhaustible and as large as claimed by Guayule enthusiasts.

"It may be added that the quality of Guayule rubber is very inferior, the rubber being very sticky and rapidly deteriorating. The market value is very low in comparison with that of first class rubbers, but it still leaves a wide margin for profit, and the supply of rubber plants is apparently enough for a few factories, not too closely situated. As a special product the Guayule has a market of its own, and if cultivation of this plant can be accomplished on a profitable basis, it will prove a great boon to the sterile parts of Northern Mexico.

"Another rubber plant of Mexico, *Euphorbia elastica*, has been spoken of. I have seen the plant, but have not been able to obtain a sample of the product, which I understand, however, somewhat resembles the Guayule rubber."

In addition to this article, another communication on the same subject by Dr. R. Endlich appeared in *Der Tropenpflanzer* (July, 1907, under the title "Uber den gegenwärtigen Stand und die Aussichten der Guayuleindustrie (on the present conditions and the prospects of the Guayule industry"). From it the following observations may be added to what has been said above.

Dr. Endlich recognises a central area of 75,000 square Rm. (28,950 square miles) of Guayule land, comprising the northern parts of Zacatecas and San Luis Potosi, the eastern part of Durango and the south of Coahuila. Then there are smaller areas in Nueva Leon, Chihuahua, New Mexico, Arizona, and Texas. About one-tenth of the central area may be said to be stocked with Guayule, yielding on the average $\frac{1}{2}$-ton per hectare ($\frac{1}{5}$-ton per acre). The total supply of Guayule available is estimated at from 400,000 to 500,000 tons, but Mr. Hexly C. Pearson, the American expert of the "India Rubber World" (New York), allows only 300,000 tons. Investigations into the yield of rubber made by a competent chemist at Jimulco gave a result of 7–12 per cent., which agrees well with Pearson's figures of 6–11 per cent. Dr. Endlich, quoting from Pearson (in "El Financiero mexicano," 15 de Avril de 1907) states that the export of Guayule rubber up to the end of January, 1907, was 6,100,000 lbs., of which 2,700,000 lbs. go to the second half of 1906 and 700,000 to January of the current year. The last prices quoted were 65 cts. gold per lb. per New York, and 5·50–5·75 M. per Kg. per Hamburg.

The extent to which Guayule land is restocked spontaneously is satisfactory, as there are plenty of seeds and the seeds germinate readily; but growth is slow, ten years being about the time required for a Guayule plant to become fit for profitable working. By that time the stem should have a diameter of $\frac{3}{4}$-in. at the base. As to cultivating the plant Dr. Endlich is more hopeful now. Although the experiments made in that direction were on a small scale, he considers the fitness of the Guayule for plantation proved. Wherever soil and climate correspond to the physical conditions prevailing in the Mexican Guayule region, waste land might be profitably stocked with Guayule, particularly along with cattle-rearing as the primary industry. So far as soil is concerned the presence of a certain amount of lime seems to be essential, and as to climate it should be kept in mind that the occurrence of the Guayule shrub in the central area is limited to altitudes between 900 and 1,700 m. Sloping or undulating ground would answer best the situations of its natural habitats.

Owing to the fact that Mariola (*Parthenium incanum*) has been mistaken for the Guayule (*P. argentatum*) it seems desirable to provide, if possible, against a repetition of the mistake. The following diagnostic comparison of the two plants, prepared by Dr. O. Stapf, may it is hoped, serve this purpose.

Although the structure of the flowers and flowerheads of *Parthenium argentatum*, A. Gray, and *P. incanum*, H. B. K., is very

similar, there ought to be no difficulty in distinguishing the two plants, particularly when they grow, as is frequently the case, side by side. To facilitate comparison the more salient characters are set out here in parallel columns.

Parthenium argentatum.	Parthenium incanum.
A small *shrub* with a short stem and very numerous, much divided branches, from less than 1 to over 3 feet high; woody persistent branches short, more or less gnarled, covered with a rather smooth, dark grey bark; young shoots silvery grey all over.	A small *shrub*, 1–2 feet high, much branched; woody persistent branches, elongate, slender, covered with a somewhat rough bark, cracking longitudinally; young shoots finely whitish or greyish woolly.
Leaves lanceolate, acute, entire or more often with 1–3 coarse acute teeth or lobes, 1–2 in. long, 2–6 lin. wide, densely covered with a fine, silvery grey tomentum, gradually narrowed into an often long and slender petiole.	*Leaves* obovate to obovate-oblong in outline, crenate (the smaller) to deeply pinnatilobed, ½–1 in. long (rarely more), ⅓–¾ lin. wide, lobes 1–2 on each side, entire or the terminal crenate, all very obtuse, the whole leaf densely covered with a white woolly tomentum when young, then greyish; petiole very short.
Flower heads subsessile, subglobose, 2 lin. in diam., 3–7 in a cluster; clusters at the ends of 2 or 3, rarely more, slender branches, collected into a very imperfect corymb, rarely solitary.	*Flower heads* shortly peduncled, or subsessile, 2 lin. in diam., in terminal, often much branched corymbs, 1–4 in. in diam.; branches slender.
Involucre silky pubescent; outer bracts broadly herbaceous on the back.	*Involucre* finely villous; outer bracts slightly herbaceous on the back above the middle.

Specimens of the Guayule plant (*P. argentatum*) and of Mariola (*P. incanum*), presented by the Foreign Office, also a sample of Guayule rubber, presented by the Compania Explotadora Coahuilense, are exhibited at Kew in Case 68, Museum No. I.

XLVII.—A NEW RUBBER TREE: PALO AMARILLO.

(*Euphorbia fulva*, Stapf; syn. *E. elastica*, Altamirano and Rose, not of Jumelle.)

Otto Stapf.

In July, 1905, Dr. Altamirano, Director of the Instituto Medico Nacional, Mexico, and Dr. J. N. Rose, Assistant Curator of the National Museum, Washington, published a description and illustrations* of a new species of *Euphorbia* (*E. elastica*) known in Mexico as El Palo Amarillo. From the name, a footnote, and the description of the plates, it could be gathered that the plant was used and recommended for the production of rubber. A fuller memoir on the subject by Dr. Altamirano† appeared in the

* Dr. F. Altamirano, El Palo Amarillo (*Euphorbia elastica*, Altamirano and Rose, sp. nov.) pp. 1–3, tt. I–IV. (Secretaria de Fomento, Colonizacion e Industria. Instituto Medico Nacional, Mexico, 1905).

† Dr. F. Altamirano, El Palo Amarillo como productor de caucho. Primera memoria (Mexico: imprenta y fototipia de la Secretaria de Fomento, 1905).—Not seen.

same year. An abstract of this was published by Dr. R. Endlich* of Mexico, and the notes given below on the tree and the rubber production from it are taken from this article.

Unfortunately the name *Euphorbia elastica* was, a few months previously, viz., in April of the same year, given by Professor Jumelle to a totally different species of *Euphorbia*, a native of Madagascar. The Mexican plant had therefore to receive a new name and, as "Amarillo" corresponds to the Latin "fulvus," I propose for it the name *Euphorbia fulva*.

Euphorbia fulva is a tree 8–10 metres high, with a yellow, smooth, shining bark; hence the name Palo Amarillo†, that is "yellow tree." It occurs in the States of Michoacán, Guanajuato, Jalisco, and in the western parts of the State of Mexico, usually at an altitude of 1500–1900 m. The annual rainfall of that area is between 550 and 750 mm., and the mean annual temperature between 17° and 20° C. (62·5°–68°F). The tree thrives well also on stony or rocky soil. Attempts to produce rubber from its latex were made in Michoacán some time ago, but given up as no process was known to separate the rubber from the resin, which occur in the proportion of 18–20 per cent. and 40 per cent. respectively. Recently, however, Professor Lozano succeeded in separating completely the two substances and producing very good rubber, according to some, even better than "caucho negro" (Central American rubber), and, from the resin, an excellent varnish. The process of separation has, however, so far not been made public, and at the time when the article was written the whole matter was still in the experimental stage, although plans for working the Palo Amarillo in Michoacán were under consideration. Since then an application for a concession to establish and work factories for the extraction of rubber from the tree in the States of Guerrero, Jalisco, Michoacán, Guanajuato, Oaxaca, Puebla, Lower California, Colima, and the Territory of Tepic has been made by Senor Carlos Llaguna y del Hoyo, of Michoacán.‡

The latex of Palo Amarillo is yellowish white, thin, and does not coagulate readily. To effect this it is exposed to the sun. If not subjected to Lozano's process the product is dark yellow, dough-like and neither resilient nor viscous. If boiled the latex turns very sticky and whitish grey. Experimental tapping in Guanajuato and Michoacán resulted in an average yield of 1 lit. (1·75 pint) of latex per tree. It is recommended to proceed with the tapping from the branches downwards, and to use sharp tools. If the tapping is done judiciously the tree may be ready for another yield after three months, and it is expected that it will stand three tappings per annum for 10 years. In Atecucario hatchets or "machetes" (large knives) are used, and the incisions are made in an oblique direction parallel to each other, or in spirals. The latex is collected in petroleum cans or small pots. A certain portion coagulates on the tree and is removed with knives. It

* Der Tropenpflanzer, 1906, pp. 525–531.

† The name Palo Amarillo is also applied to *Berberis pinnata*, Lag. (Mahonia pinnata, *Fedde*), and to two species of *Bocconia*, viz:—*B. arborea*, Wats., and *B. frutescens*, Linn.—See Ramirez, Sinon. Plant. Mex. p. 52.

‡ Diario Oficial, dated March 8th, 1907, according to an official despatch to the Foreign Office by Mr. R. Tower, Envoy Extraordinary and Minister Plenipotentiary, Mexico, dated March 12th, 1907.

has been calculated that 100,000 trees would yield 300,000 Kg. (about 294 tons) latex per annum, from which 54,000–60,000 Kg. (53–58 tons) rubber and 120,000 Kg. (116 tons) resin might be obtained. The price of the rubber is estimated at 2 pesos (about 4*s.*), and that of the resin at 75 cms. (1*s.* 6*d.*). The scattered occurrence of the tree, however, and the great distance of the areas where the tree is fairly common are a considerable drawback. It has therefore been proposed to lay out plantations of the tree, the more so as it is easily propagated by cuttings and grows fast. Large tracts of waste land might in this way be made productive.

A valuable by-product of the Palo Amarillo is the oil (about 30 per cent.) extracted from the seeds. It is a good drying oil for varnish, and, like the oils of other *Euphorbiaceae*, a purgative.

Considering the favourable nature of Dr. Altamirano's and Dr. Endlich's accounts, it may be useful to point out that Mr. George Kennedy, H.M. Vice-Consul at Mexico, reports as late as February 28th, 1907, that no satisfactory process has yet been discovered to separate these two substances at a sufficiently low cost to give the "Palo Amarillo" a commercial value as a rubber producer. He also gives the proportion of rubber and resin (desiccated ?) contained in the latex of *Euphorbia fulva* as 40 and 60 respectively.*

Finally it may be added that *Euphorbia fulva* belongs to a small group (*Laurifoliae*, Boiss.) of arborescent Euphorbias extending from Mexico to Peru and the West Indies. One of these species, *E. calyculata*, H. B. K., locally known as Chupire or Tencuante, in some parts of Mexico, occurs with *E. fulva*. Its latex is very inferior and Dr. Altamirano suggests that the unsatisfactory result of the examination of certain samples of "Palo Amarillo" rubber may be due to a confusion of the two species. *E. fulva* can be easily distinguished from *E. calyculata* by its smaller leaves (3–6 cm. by 1–2 cm.) which are woolly beneath, its short, stout, leafless flowering branches, dividing into 4–5-rayed umbels, of which, however, only one ray is properly developed bearing a flower or fruit. The West Indian species is *E. punicea*, Sw., a native of Jamaica, Cuba, and the Bahamas. Nothing is known as to its economic value.

XLVIII.—MISCELLANEOUS NOTES.

Sir J. D. Hooker.—His Majesty the King has been graciously pleased to confer the Order of Merit on Sir J. D. Hooker, G.C.S.I., C.B., F.R.S., formerly Director of the Royal Botanic Gardens, Kew.

Mr. A. W. Hill, M.A., Fellow and Dean of King's College, Cambridge, and University Lecturer in Botany, has been appointed Assistant Director of the Royal Botanic Gardens, Kew.

* Report, enclosed in Mr. Tower's despatch, Commercial No. 13, of the 1st of March, 1907.

Lilium tigrinum.—Kew received in January of this year some bulbs of a *Lilium* from Messrs. Watson & Scull, 90, Lower Thames Street, E.C., who stated that they had been sent by a nurseryman in Shanghai with the information that they were of an unknown lily from the interior of China, where they were cultivated for some medicinal property contained in the bulbs and that they had stems four to six feet high and flowers "white with a little yellow." The bulbs on comparison with cultivated examples of species of *Lilium* were most like those of *L. auratum*, and the description of the flowers also pointed to that species, which however is known only from Japan, although it has been suggested that it may be of Chinese origin. Bulbs of an "unknown lily from China, with white and yellow flowers" were soon afterwards offered for sale by English and other dealers, and a dozen, were purchased for Kew. Some of the plants, from both sources, are now in flower and they prove to be nothing more than *L. tigrinum*, Ker-Gawl., one of the most widely cultivated of Chinese Liliums, which was first introduced into England in 1804, where it is now in almost every garden, and is represented by several well-marked varieties, including one with double flowers. It has been collected wild in Peking (*David*); Hupeh; Ichang and Patung (*Henry*); Szechuen; Tchenkeoutin (*Farges*); Corea (*Perry*); Chemulpo (*Carles*); the Corean Archipelago (*Oldham*). It is also wild in Japan. Dr. Henry states that in Ichang this species is cultivated and the bulbs eaten, and that dry lily flowers are used by the Chinese for flavouring soups and as a remedy for pulmonary diseases (see also *K.B.*, 1889, p. 116). It is therefore not impossible that the particular form of *L. tigrinum* now in question, with bulbs unlike those of the forms usually known in gardens, may be one of those cultivated in China as a vegetable.

W. W.

The Treatment of Cacao and other Seeds for Export.—The distribution of *Theobroma Cacao* by Kew has hitherto been by means of young plants packed in Wardian Cases, as seeds, whenever tried, had proved a failure. A method of packing the seeds, recorded in the *U.S. Monthly Consular Reports* for March, 1906, and noticed in the *West Indian Agricultural News* of October 20, 1906, was stated to have been successful when tried in Samoa, and it was decided to put it to the test at Kew.

The account of the method is as follows :—

"Consul-General Heimrod submits a method of packing cacao seeds for export which has been practically tried in Samoa with excellent results and which he believes will be of special value to planters in the Philippine Islands.

"The seeds should be selected from ripe pods and well washed in water, then placed on a rough towel and gently rubbed in order to remove most of the pulp, taking care not to damage the skin. The seeds are next placed in a current of cool air for twenty-four hours. The packing material is composed of equal parts of vegetable mould and finely ground or pounded charcoal, moistened just enough to resemble earth taken out of a shaded place. If the packing material is too wet, the seeds will rot; and if not

moist enough, the seeds will absorb all the water and perish. A tin box, 8 × 4 × 4, will hold about 200 seeds if packed as follows: place a layer of earth and charcoal about ¾ inch deep on the bottom of the tin box, and lay the seeds in rows, leaving a little space between each. Spread another layer of the charcoal and earth, then another layer of rows of seeds, and so on until the box is full. Packing a slip of material across when the lid fits will help to keep the moisture in. When wetting the charcoal and earth it is a wise precaution to do it twelve hours before being wanted, as this gives the water time to permeate the whole mass evenly."

Application was therefore made to Sir Daniel Morris, Imperial Commissioner of Agriculture in the West Indies, for a small consignment of seeds to be prepared and packed as recommended above, and he gave instructions to Mr. A. Brooks at Dominica to forward 100 seeds as desired. They arrived by parcel post on January 31st last, apparently in good condition, every one of them having germinated on the way. They were planted in pots and placed in a tropical pit, where in a few days a fungus disease developed on the cotyledons and destroyed all except six of the plants. Mr. Massee finds the disease to be due to a new species of *Ramularia* (*R. Necator*, Massee, *K.B.* for 1907, p. 243), which must have been either on the seeds or in the packing material before they left Dominica. This was an unfortunate mishap as the method of packing itself was a success.

A second supply of seeds, packed as prescribed above, was received from Sir Daniel Morris on May 14th. They also arrived in good condition, all of them having germinated, but some of them showed unmistakable evidence of the presence of the same fungus, whose West Indian origin is undoubted, as its presence was noted in the two different consignments of seeds immediately after their arrival. Owing to its presence Mr. Massee prepared two solutions of formalin of different strengths and in these some of the seeds were soaked before they were sown. The result was as follows:—

10 germinating seeds soaked for half an hour in a 1 per cent. solution of formalin: 4 grew, 6 failed.

10 germinating seeds soaked for one hour in a 1 per cent. solution of formalin: 3 grew, 7 failed.

5 germinating seeds dipped in a 4 per cent. solution of formalin: all failed.

75 germinating seeds planted as received: 54 grew, 21 failed.

The outcome of this packing experiment is that seeds of Cacao selected, prepared, and packed as above described, can be sent from the West Indies to England and probably much farther, and that about 70 per cent. of them are likely to produce healthy plants.

In forming this estimate, the 25 seeds treated with formalin need not be taken into account, for the experimental use of this substance shows, as was to be anticipated, that when used as a "steep" for Cacao seeds it is not only ineffective but actually injurious. The object to be attained was, in this case, the destruction of a parasitic fungus present *in the cotyledons*. The impervious testa prevented the action of the fungicide, whereas the latter injured the tender root.

On the other hand batches of Coffee seeds were soaked, before germination commenced, for one hour, two hours, and three hours respectively, in a 1 per cent. solution of commercial formalin, without sustaining the slightest injury. In fact the batch of seeds soaked for three hours was the first to germinate, owing to the consequent softening of the testa. This amount of soaking, immediately before sowing, is calculated to destroy any fungus spores present *on the surface of the seed* without producing any untoward effect.

The following account of a similar method of disinfecting Cotton seeds carried out by the officer of the Imperial Department of Agriculture, West Indies, is reprinted from the *Agricultural News*, vol. VI., No. 134, for June 15, 1907, p. 183 :—

"Experiments have been carried out by officers of the Imperial Department during the past year in Antigua, Barbados, and St. Vincent, with a view to finding out what method of disinfection should be recommended to planters of cotton. The experiments in Barbados and St. Vincent have been carried out on a field scale, and therefore the results may be taken as a guide to practice.

"A wooden tub should be carefully washed out, and a solution of 1 in 1,000 corrosive sublimate made up in it. This should then be covered down and allowed to stand. After a few days (say a week), when the reaction between the wood and the corrosive sublimate has finished, this solution should be run away, and a fresh supply made up by dissolving 1 oz. of corrosive sublimate to every 7 gallons of water. It is estimated that 1 gallon of the solution should be sufficient to disinfect 12 lb. of seed at a cost of a little more than 1c. The cotton seed is soaked in this solution for twenty minutes, then removed and spread in a thin layer, on a clean floor, or a clean canvas, to dry, either in the shade or in the sun. While drying, the seed should be turned several times, and when thoroughly dry it will be ready for planting, or may be put into bags and stored for some time. No seed should be planted without first being thoroughly dried. It is advisable to use a new solution for each new batch of seed.

"It has been shown that it is unnecessary to wash in pure water after soaking in corrosive sublimate if the seed is not to be kept for more than a few days before planting. If the seed is to be stored for any considerable length of time, it might be advisable to wash in pure water for ten minutes after taking from the disinfectant solution.

"The germination of the seeds, after disinfection for twenty minutes, would appear to be in no way affected, and, in some instances, germination has been somewhat hastened by the soaking."

Calabash Tobacco Pipes.—Among the exhibits from Cape Colony at the South African Exhibition held in London during the early part of this year was an interesting series of specimens illustrating the Calabash Pipe industry.

As it was impossible at the time to obtain a selection from these for the Museum the good offices of Prof. H. H. Pearson, M.A., F.L.S., Hon. Curator of the Government Herbarium, Cape Colony, were requisitioned, and he very kindly undertook to obtain the necessary material, which has recently come to hand and has been placed in Case 57, Museum No I.

The identification of the plant furnishing the fruit from which these pipes are manufactured is not quite clear, but they are certainly not made from the common Calabash (*Crescentia Cujete*), a tree of the West Indies and South America. Judging, however, from an illustration and from some seeds kindly forwarded by Prof. Pearson, it appears almost certain that they are made from the fruits of one of the forms of the Bottle Gourd (*Lagenaria vulgaris*) which is employed in various parts of the world for a great variety of purposes, well illustrated by examples in the Museum Case mentioned above.

The following note on this industry appeared in "Industries of Cape Colony," compiled by the Dept. of Agriculture, 1907, p. 69:—

"The making of Calabash pipes is entirely a South African industry which has only grown to considerable proportions within the last couple of years or so. The Calabash is grown in certain districts in the south of Cape Colony, and in every town of importance there are several factories. The pipe has become a favourite with tobacco smokers for various reasons, and appears to have won the place in public estimation for years held by the meerschaum. The price of the article varies according as it is mounted in gold, silver or a base metal and whether the mouthpiece is either vulcanite or amber. Employment is afforded a fair number of practical pipe makers. The Calabash pipe has not yet appeared as an article of export, but still a great many are bought by tourists and other visitors, while residents send them as presents to their friends.

"The Calabash pipe gives every promise of becoming as fashionable with smokers in South Africa as the corn cob is in America, with the additional recommendation that the Calabash is a pipe that lasts, and which smokers take as much delight in colouring as used to be the case with the meerschaum."

J. M. H.

Guide to Museum I.—A third edition of the "Official Guide to the Museums of Economic Botany, No. I." has recently been published. During the twenty years that have elapsed since the issue of the second edition the accessions to the Museum have been very numerous, requiring much additional space for their display. This was provided in 1904 by the transfer of the entire collection of Gymnosperms to a new gallery attached to Museum No. III. (*K. B.*, 1904, p. 14). The consequent rearrangement, and the incorporation of new exhibits have necessitated a thorough revision of the Guide. The system of grouping the exhibits under the Natural Orders of the plants producing them has been retained. In the Guide, under each Natural Order is given a brief

note of the general properties of the Order, followed by detailed numbered references to the more noteworthy objects. The information contained in the Guide has been carefully revised in accordance with the knowledge we now possess of the sources, areas of production and improved processes of manufacture of the extensive series of vegetable products exhibited.

Davidia.—The genus *Davidia*, Baill., has been fully and repeatedly described and figured; but as some time ago a question arose as to whether the dried specimens in herbaria and the living plants in Europe represent one or two species, it seems desirable that something be said on this point, and in its elucidation the history of the discovery of the genus, its introduction into European gardens, and the conditions under which it grows in its native country, may be briefly recapitulated. *Davidia involucrata* was discovered near Moupine, Western China, by the Abbé David in 1869, growing at an elevation of between 6,000 and 7,000 feet. A specimen was transmitted to Paris and Baillon described it (*Adansonia*, vol. x., p. 115) in 1871, and a coloured figure of it appeared in the *Nouvelles Archives du Museum d'Hist. Nat. de Paris*, série, 2, 1885, vol. viii., p. 242 t. 10. Previously, in vol. v. (1882) of the same publication, p. 161, David, in a general description of the position, climate and vegetation of Moupine, mentions: "L'arbre curieux que M. Baillon a bien voulu appeler de mon nom, *Davidia tibetana*, croit aussi vers 2,000 mètres d'altitude." Now, there is no doubt, as we shall presently demonstrate, that David was writing of the very same tree that Baillon described, and not of a second species, as assumed by André (*Revue Horticole*, 1902, p. 378) and others.

In December, 1871, the same year that Baillon published his description, Prof. J. Decaisne sent to Kew a leaf and a bract and a sketch of the material described by the former, with the remark: "Le Muséum ne possède que le seul exemplaire dont voici le calque . . . . On m'avait assuré que le *Davidia* se trouvait dans les pepinières d'A. Leroy à Angers." We have found no confirmation of the latter statement; but E. André, in the place cited above, gives the history of the successful introduction of a *Davidia* by Messrs. de Vilmorin, through Père Farges, a missionary. There were two consignments; one from Szechuen, in 1897, and the other from "Eastern Tibet," in 1898. Moupine it should be explained, was regarded by the missionaries as being in Tibet, but we follow Bretschneider's map, where it is placed in Western Szechuen, though the boundaries of China Proper and the adjoining tributary States are not well defined. It is important, however, to note this geographical fact, because there are two varieties, or closely allied species, of *Davidia*: the one from Moupine, otherwise "Eastern Tibet," and the other from more eastern localities. Out of the two lots of seed received by Messrs. de Vilmorin, only one seed germinated, and that after lying in the ground two years! It was one of those received in 1897, and the seedling flourished so well that in 1901 four cuttings were taken off and one branch was layered. Two of the cuttings grew and eventually one of the resulting plants was presented to

the Jardin des Plantes, Paris, and the other to Kew. The layer was intended for Prof. Sargent. In May of last year the original plant flowered, and figures appeared in the *Revue Horticole*, p. 297, and in the *Gardeners' Chronicle*, vol. xxxix., p. 346, and Mr. M. de Vilmorin presented Kew with a good herbarium specimen. In 1889, twenty years after David's discovery, Dr. A. Henry sent good flowering and fruiting specimens to Kew, and Prof. D. Oliver described and figured the fruit in *Hooker's Icones Plantarum* t. 1961. Henry's specimens were taken from "the only tree observed during a six months excursion." It grew in South Wushan on the Yangstze-kiang, just within the eastern boundary of Szechuen.

Ten years later Mr. E. H. Wilson went to China to collect for Messrs. James Veitch & Sons, one of the principal objects of the mission being to procure seeds of *Davidia*, in which he was highly successful. He was fortunate in discovering a considerable grove of trees to the south-east of Wushan between Patung and Nanto, Hupeh, in about 110° 45′ longitude. There he found abundance of seed, which he transmitted to Messrs. Veitch, who raised a large number of plants; and the writer described and illustrated the germination and early condition of the seedlings in the *Journal of the Linnean Society*, vol. xxxv., pp. 556–559, t. 19. On his second journey, in 1903, Mr. Wilson collected specimens of *Davidia* in the mountains south of Moupine and west of Yachan, Szechuen, in about 102° 40′ long. and 30° 20′ lat.; and in 1904 he collected further specimens on Mount Omei, in about 103° 40′ long. and 29° 30′ lat.

Previous to Mr. Wilson's departure on his third journey to China, he called my attention to certain differences exhibited by the specimens of *Davidia* from different localities, and I have since examined the rich material at Kew.

Wilson's specimens, collected near Moupine, are exactly like Baillon's original of *D. involucrata*, which differs from all the other specimens collected by Wilson, as well as from those collected by Henry, in having the under surface of the leaves, even of the mature ones, clothed with a white tomentum. All the other specimens have glabrous or early glabrescent leaves. But there are no other obvious differences, and I think they can only be classed as varieties of one species. So far as I have seen, all the plants in cultivation have glabrescent leaves. The largest leaves of the Moupine variety, including the petiole, are nearly 30 cm. long and the largest bracts 15 cm. long and 11 cm. broad. None of the more numerous specimens of the other have leaves or bracts quite so large; but that, of course, counts for nothing.

Some of the Abbé David's notes respecting the climate of Moupine and the plants with which *Davidia* is associated, are worth repeating for the information of the cultivator.

Moupine itself is at an elevation of 7,100 feet, and to reach it from the east it is necessary to cross a pass rising to 10,000 feet. It is surrounded by loftier peaks, the highest being nearly 17,000 feet, and wooded up to 11,600, with beautiful pastures above, without perpetual snows. From the summit, much higher, snow-clad peaks can be seen in the distance. A curious fact in the climate

is that the snows and fogs of winter usually cease lower down in the forest zone, leaving the upper zone dry and serene. The climate of Moupine is very rigorous and unpleasant; the winter cold, with much snow, which lies in the sheltered valleys till May or June. During the rest of the year there is almost daily rain, and the atmosphere is always fully charged with moisture. *Davidia* grows in the partial shade of larger trees, such as a *Cerasus* with small red fruits; a gigantic *Corylus*; a *Quercus* having a corky bark; numerous *Lauraceae* and *Ficus*, both erect and of great stature, and climbing.

W. B. H.

The Forests and Forest Flora of the Colony of the Cape of Good Hope.—Mr. T. R. Sim, F.L.S., well known, by his writings at least, to all students of the vegetation of South Africa, has presented to Kew a copy of his *magnum opus*, bearing the above title, and the date, 1906. It is a quarto, with 361 pages of letterpress, illustrated by 160 plates drawn by the author, and representing 312 species. We are so apt to consider Cape Colony as almost devoid of forest, that a large book on Cape forests comes almost as a surprise. It is true, however, that the forest area is relatively very, very small; a fact confirmed by the opening words of the author's preface. He says: "The Colony of the Cape of Good Hope has during many centuries suffered, and it still continues to suffer, climatically, as well as economically, through the absence of a fair proportion of forest-covered surface. In both these respects the position went rapidly from bad to worse during the first three-quarters of the last century, mostly through the malign influence of man, and it is only in more recent years, and more particularly since the passing of the Forest Act in 1888 that a serious endeavour, on scientific lines, to maintain and improve the quality of the Crown forests has been made, or even became possible." It is satisfactory to note that a beginning has been made in establishing a well organised and effectively administered Forest Department, and, not least among the means to success is the excellent book compiled by Mr. Sim, who was formerly District Forest Officer at King William's Town, Cape Colony, and who now holds the position of Conservator of Forests in Natal. Mr. Sim has had the advantage of the co-operation of all the leading botanists and forest officers in South Africa, and the Governments of Cape Colony, Transvaal, Orange River Colony, and Rhodesia have united in defraying the cost of publication.

The subject matter is set forth and discussed in chapters, of which it may be useful to give the headings:—I. The Forests of Cape Colony Described; II. Area and Value of Cape Forests; III. Economic Composition of the Forests; IV. Factors affecting the Forests; V. Gradual Reduction of Forest Areas in the Past, and the Retrogressive Nature of the Forests; VI. Factors affecting the Distribution of Species; VII. Economic Value of Cape Timbers; VIII. The Protection and Exploitation of the Forests; IX. Artificial Afforesting; X. Epitome of the History of Cape Forestry; XI. Species reserved under the Forest Act; XII. Synoptical Index of the Classification; XIII. Artificial Key to the

Genera; XIV. Systematic Descriptions; XV. Index. Chapters I. to XII. occupy rather less than a hundred pages, but they are full of interesting information, so arranged that it is quite easy to find what one is in search of.

The author states that in consequence of the requirements of other industries, and especially the mining industry, the forests were left out of sight in the construction of railways. He continues :—"Thus they remain difficult of access and little known, and of the hundreds of thousands of visitors from abroad who took part in the recent war, probably 90 per cent. neither saw nor heard of any Cape forest, and would agree with Max O'Rell when he says, 'In South Africa the land is scarcely more clothed than the natives who inhabit it. When you have travelled north for a few hours all vegetation disappears; no more trees, no more shrubs. The grass grows on the earth and on the sides of the mountains as the hair grows on the heads of the Kaffirs, in little tufts here and there.' Or they might even feel inclined to apply to many parts his description of what was the Orange Free State when he visited it—'It is desolation, isolation, immensity!'

"Nevertheless, actual forests do exist, and, though they form only 0·21 per cent. of the whole area of the Colony, there are 613 square miles of them, besides twice that area of less closely forested reserves, the estimated total value being £4,000,000." One can better realise the very small proportion of real forest by the fact that it is only about $\frac{1}{500}$th of the area of the Colony; in other words, about 25 miles square, or less than half the size of the county of Sussex! But the fact that the Colony has produced such a practical "Forest Flora" raises strong hopes of future extensions.

W. B. H.

Rubber cultivation in the British Empire.—The Library at Kew is indebted to the publishers for a copy of *Rubber Cultivation in the British Empire*. The work is a reprint of a lecture recently delivered before the Society of Arts by Mr. H. Wright, who is known as an authority on rubber. The book, which is well printed, is issued by Messrs. Maclaren & Sons. It consists of 108 pp., 8vo.; in it the writer has brought together in a concise form much useful information on the subject.

Bromeliaceae Andreanae.—To Mr. W. E. Gumbleton, of Belgrove, Queenstown, Co. Cork, who has already presented several rare and valuable books to Kew, the library is now further indebted for the gift of a handsomely bound and beautifully hand-coloured copy of the *Bromeliaceae Andreanae*. This copy is, we understand, the only coloured copy of this work in existence with the exception of that belonging to the author, from which the colouring of the copy now received was taken. The continuation of the title runs: "Description et Histoire des Bromeliacées recoltées dans la Colombie, l'Ecuador et Venezuela, par Ed. André. Ouvrage illustré de 39 Planches lithographiées et d'une carte partielle de

l'Amérique du Sud." Mr. André, who is an old and valued correspondent of Kew, visited South America, under the auspices of the French Government, for the botanical exploration of the countries named, where he collected assiduously in 1875 and 1876. Of the *Bromeliaceae* alone he collected 129 species and 14 varieties belonging to 14 genera. No less than 91 of the species are described as new, and seven others, of which only imperfect material was collected, were almost certainly undescribed. The collection also yielded two new genera, namely, *Sodiroa* and *Thecophyllum*. Upwards of 70 of the species are more or less fully illustrated; some only by analyses of the flowers. It may be added that the plain copy, previously possessed by Kew, was presented by Mr. André.

The Cyperaceae of the Philippines.—The Philippine *Journal of Science* for April, 1907, contains an enumeration of the Philippine *Cyperaceae* in the Kew Herbarium by the late Mr. C. B. Clarke. It comprises 127 species belonging to 22 genera, and is not put forward "as complete in any respect." The more important synonymy relating to the Philippines and adjacent lands is given, and there are short notes on the genera and species, which are "not given as sufficient diagnoses, but are intended to be useful to assist collectors in the field." The general distribution of each species follows its distribution in the Philippine Islands. One new species, *Mariscus Merrillii*, is described. This little contribution to cyperology has a melancholy interest as being the last prepared for the press by the author, whose exhaustive monograph of the order still lies in manuscript.

London Botanic Gardens.—A small volume under this title has recently been published by the Wellcome Chemical Research Laboratory. It consists of a reprint of a series of articles contributed to the *American Journal of Pharmacy* by Mr. P. E. F. Perrédès in 1905 and 1906. These articles give descriptions of the Chelsea Physic Garden, the Royal Botanic Society's Garden, the Royal Horticultural Society's Garden, and the Royal Botanic Gardens, Kew, regard being had to their scientific and economic functions rather than to any recreative features they may possess. A short but well-informed history of each institution is given, attention being called to the direction in which its influence has been most markedly exerted. Thus the Chelsea Physic Garden and the Royal Botanic Society's Garden are shown to have had the teaching of Botany, particularly in relation to medicine and pharmacy, as their dominant feature, while Kew is said to "stand out prominently as a centre of botanical research, and as the cradle of botanical enterprise in India and the Colonies."

Mikania scandens in Fiji.—The following letter has been received from Mr. C. H. Knowles, Superintendent of Agriculture, Fiji :—

"Fiji, 17th May, 1907.

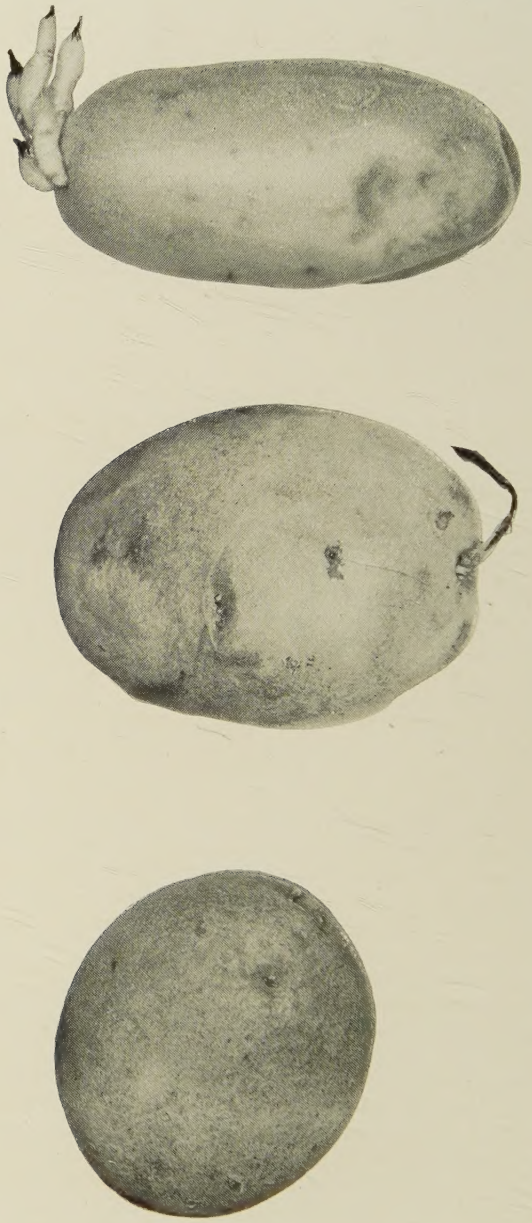
"I have the honour to inform you that I am forwarding specimens of root, stem, leaves and flowers of a vine that is a serious nuisance as a weed in the wet districts of Fiji. The Fijian name is *Wa Butako*, which means 'Thief' or 'Pirate,' having reference to the rapid way in which it spreads and makes itself at home in the native and other cultivations.

"In the bush on the sides of the road from Suva to Rewa it is to be seen climbing on the trees and posts, and when the bush is cleared this vine makes its appearance climbing up all stumps and often forming a thick carpet on the land. In cane fields it climbs around cane and does much damage if unchecked. It is easily removed by the laborious method of hand-picking, but horse cultivation does not appear to kill it.

"I should be much obliged if you would have it examined and inform me of its botanical name and where it is a native of. I regret that I am unable to obtain any information as to the history of its arrival and spread in the Colony."

The specimens show that the weed in question is *Mikania scandens*, Willd. This species is common in most hot countries. In Lower Bengal it sometimes gives much trouble, and the description of its behaviour in Fiji given by Mr. Knowles tallies exactly with what has been observed in the neighbourhood of Calcutta. In India, as in Fiji, the only method of checking the pest that has been of any use has been that of carefully removing the plant by hand and destroying it.

Seedling sugar-canes in the West Indies.—From the *Agricultural News* we learn that the cultivation of new seedling sugar canes, as compared with the Bourbon and other varieties hitherto grown in British Guiana and elsewhere in the West Indies shows considerable progress in recent years. From returns to hand it appears that 28,801 acres were planted in British Guiana in seedling canes in 1906–7. The area in 1905–6 was 14,743 acres and 1904–5, 9,518 acres. Amongst the more important seedling varieties are the Demerara seedlings D. 109 and D. 625; while two Barbados seedlings, B. 208 and B. 147 are also largely cultivated. An Editorial note which appeared in the *International Sugar Journal*, in May last (pp. 219-220) discussing the "Identity of Seedling Canes in Demerara" asserts that it was "an ascertained fact" that the seedling Cane B. 208 cultivated on the well known Diamond Plantation in Demerara "was not the original seedling of that variety." Samples of B. 208 from Diamond Plantation have, however, since been submitted to a critical examination by the Imperial Department of Agriculture for the West Indies, and it is stated that they are identical with the original seedlings of that variety raised at Barbados.



DEGENERATION IN POTATOES.

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